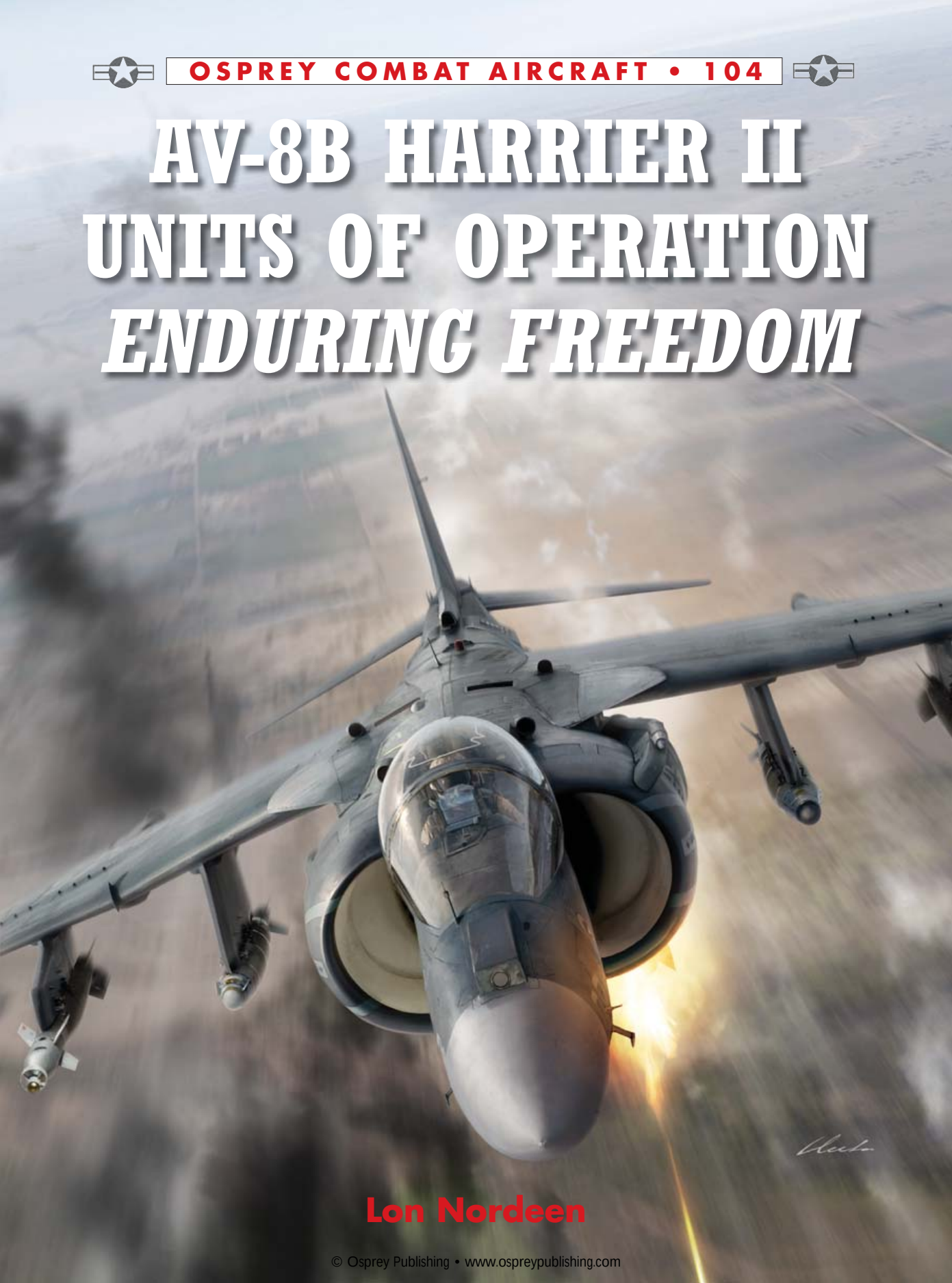
OSPREY COMBAT AIRCRAFT • 104

AV-8B HARRIER II UNITS OF OPERATION *ENDURING FREEDOM*



Lon Nordeen

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CONTENTS

INTRODUCTION 6

CHAPTER ONE

USMC AND AV-8B AIR SUPPORT 7

CHAPTER TWO

OEF 2001-02 13

CHAPTER THREE

OEF 2002-03 22

CHAPTER FOUR

OEF 2004-06 31

CHAPTER FIVE

OEF 2007-10 53

CHAPTER SIX

THE SURGE 69

APPENDICES 91

COLOUR PLATES COMMENTARY 92

INDEX 95

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INTRODUCTION

The STOVL (short take-off and vertical landing) AV-8B Harrier II provides unique capabilities since it is presently the only tactical aircraft forward deployed on amphibious assault ships and at forward operating bases with short runways that can support the full range of military operations due to its speed, firepower and flexible basing options. Missions undertaken by the STOVL AV-8B Harrier II include air interception and ground attack, helicopter and vehicle escort and armed reconnaissance.

Since the autumn of 2001, US Marine Corps AV-8B squadrons have been stretched to the limit providing support for Operation *Enduring Freedom* (OEF) and Operation *Iraqi Freedom* (OIF), as well as undertaking scheduled Marine Expeditionary Unit (MEU) deployments, exercises and regular training requirements. Throughout this period the US Marine Corps/US Navy/contractor team have worked tirelessly to keep the AV-8B up to date through equipment improvements. These have included the fitment of the higher-thrust Rolls-Royce Pegasus F402-RR-408 engine, Night Attack enhancements, Harrier II+ modification that added the AN/APG-65 radar and the addition of the AN/ALQ-28(V) Litening II FLIR/laser designation pod, ROVER and ongoing Operational Flight Programme updates and technical modifications to ensure utility and safety.

Despite all of the challenges AV-8B squadrons have successfully demonstrated the utility of the STOVL jet through firepower and intelligence, surveillance and reconnaissance (ISR) contributions during operations supporting American, Coalition and Afghan ground forces from the autumn of 2001 through to September 2013.

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USMC AND AV-8B AIR SUPPORT

The US Marine Corps is a combined arms force with ground, combat support and aviation assets that train and fight together to conduct expeditionary manoeuvre warfare. Since the US Marine Corps is essentially a light infantry force when compared to most armies, with the emphasis being on manoeuvre and assault from the sea, it relies on aerial firepower in the form of attack helicopters and tactical aircraft, such as the STOVL AV-8B (and conventional F/A-18A/C/D) to make up for the limited availability of organic artillery support. Indeed, the range, firepower and accuracy of weapons delivery offered by tactical aircraft are far superior to those achieved by artillery, naval gunfire and attack helicopters.

Operating the US Marine Corps' principal tactical aircraft types, personnel within the Harrier II and Hornet communities have often endured a somewhat fractious relationship over the years. Both aviation programmes compete for limited funding, which is secured from the US Navy's budget. The Hornet is a superb multi-mission strike fighter that performs the air-to-air role and strike and reconnaissance missions. US Marine Corps squadrons equipped with the F/A-18A/C variant have directly supported the US Navy since the Hornet can operate from aircraft carriers. And with both the US Navy and US Marine Corps flying the F/A-18, fighter attack squadrons within the US Marine Corps have benefited from US Navy support, investments and upgrades to the aircraft over the past three decades.

The twin-engined Hornet is faster than the Harrier II, has a slightly greater range and can carry more ordnance for Close Air Support (CAS), depending on the mission and load configuration. It also has a much better safety record than the AV-8B, but requires a 6000 ft runway to operate from.

Although not flown by the US Navy, the AV-8B was seen as a special case 'Green machine' developed to provide CAS for US Marine Corps ground forces by operating from amphibious assault ships and shorter airfields close to the battlefield. The US Marine Corps has often had to work through Congress in a series of 'budget wars' to secure funds for the AV-8B. Due to its unique vertical/short-takeoff and landing (V/STOL) or short takeoff and vertical landing (STOVL) flight characteristics, and associated design, the Harrier II is more challenging to fly, requires more maintenance and has a significantly higher accident rate.

Multiple US Marine Corps Harrier II and, in recent years, Hornet squadrons have been committed to OEF in order to meet US Marine Corps and International Security Assistance Force (ISAF) air support requirements for the campaign. For the US Marine Corps, US Army or ISAF soldiers on the ground in Afghanistan, the Harrier II and the Hornet

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have provided effective and accurate air support, since both jets carry FLIR/laser targeting pods, cannon, rockets and precision-guided munitions, including laser-guided bombs, Maverick missiles and, later, Joint Direct Attack Munitions (JDAM) GPS weapons.

AV-8B units typically come under the control of the Marine Air-Ground Task Force (MAGTF) commander when deployed, being part of a force that can range in size from the small Marine Expeditionary Unit-Special Operations Capable (MEU-SOC) aboard three ships to a division-size (16,000+ personnel) Marine Expeditionary Force (MEF). Since the 1970s US Marine Corps Harriers have regularly deployed as a part of the aviation combat element of a MEU-SOC embarked in amphibious assault ships assigned to an Expeditionary Strike Group (ESG). The latter usually consists of one 40,000-ton Landing Helicopter Dock (LHD) or 45,000-ton Landing Helicopter Assault (LHA) ship, which carries most of the aircraft and more than half of the personnel and equipment of the MEU-SOC, and two smaller amphibious landing ships.

Aviation combat elements are always part of a MAGTF, which includes a command element, ground force and combat support elements. The aviation element provides support for the 1200 Marines assigned to combat units of the three ships of the ESG. Generally, six AV-8Bs, nine pilots and about 90 support personnel from a US Marine Corps Harrier II squadron are assigned to a composite squadron. This unit also includes a squadron of CH-46 medium lift helicopters or, more commonly, V-22 tilt-rotors, a detachment of CH-53 heavy lift helicopters and a smaller number of AH-1W Super Cobra attack helicopters and UH-1Y liaison helicopters, as well as and several hundred support personnel and flight crews.

The AV-8B was blooded in combat during Operation *Desert Storm* in early 1991, when US Marine Corps pilots completed 3380 combat missions in the Harrier II and delivered 5.9 million pounds of high explosive bombs, cluster munitions and other ordnance supporting Coalition forces to liberate Kuwait from Iraqi control. During the 41 days of intense strike operations against Iraqi forces, five AV-8Bs were lost in action to surface-to-air missiles/anti-aircraft artillery or operational causes, with two pilots being killed and two taken prisoner. The Harrier II's role in the campaign is discussed in detail in Osprey Combat Aircraft 90 – *AV-8B Harrier II Units of Operation Desert Shield and Desert Storm*.

HARRIER II UPGRADES

Even before *Desert Shield/Desert Storm* the US Marine Corps was moving forward with improvements for the AV-8B. With its electro-optical Hughes ASB-19 Angle Rate Bombing System (ARBS), the AV-8B day attack aircraft (161 produced) was essentially a clear air strike aircraft optimised for CAS. In June 1987 the first Harrier II Night Attack prototype (originally built as the 87th AV-8B) was rolled out, this variant being equipped with a Forward Looking Infrared (FLIR) sensor in the nose, an upgraded head-up display (HUD), a digital moving map, two-colour cockpit displays and cockpit lighting compatible with night vision goggles (NVGs). These improvements allowed AV-8B pilots to effectively fly and fight at night. In addition, the Night Attack Harrier II incorporated a larger Leading-Edge Root Extension (LERX), which improved agility. Four upward-firing chaff/flare dispensers were also added in the aft fuselage.

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The US Marine Corps received the first of its 65 AV-8B Night Attack aircraft in September 1989 (production aircraft 167 to 232), with initial deliveries going to squadrons located at MCAS Yuma, Arizona.

In 1990 the AV-8B Night Attack airframe commenced flight testing with the F402-RR-408 engine, which not only provided 3000 lbs of additional thrust but was also meant to be more durable than the F402-RR-406 fitted in the original Harrier II. However, the higher thrust engine experienced a series of technical challenges that resulted in several aircraft being lost in accidents and a fleet-wide grounding of all AV-8Bs. These problems adversely impacted fleet operations and training until Rolls-Royce corrected bearing and blade issues. The F402-RR-408 engine was eventually retrofitted into all US Marine Corps Night Attack aircraft, as well as TAV-8B trainers and later Harrier II+ jets.

In September 1990 the USA, Spain and Italy agreed to fund the integration of the Hughes (now Raytheon) AN/APG-65 multi-mode radar, F402-RR-408 engine and other systems enhancements into a new version of the Harrier II. Designated the AV-8B Harrier II+, the jet was now capable of performing as an air defence fighter, precision bomber and reconnaissance aircraft all in the same mission. The US Navy funded the production of 42 brand new Harrier II+ aircraft (production aircraft 233 to 262, and BuNo 164129, which was a radar integration test conversion from a Night Attack aircraft) and the remanufacture of 74 AV-8B day attack aircraft (production aircraft 263 to 336) to Harrier II+ configuration. Production of the new/remanufactured aircraft ran from 1996 through to late 2003, when the final Harrier II+s for the US Marine Corps and Spain were delivered.

If the AN/APG-65 was the brain of the upgraded Harrier II+, then the improved F402-RR-408 engine was the aircraft's heart. Chuck Dowdle, a former Marine warrant officer with more than 18 years of AV-8B support experience, and now a Roll-Royce engine expert, was heavily involved at squadron-level with the introduction of the new jet into frontline service;

'At first glance the -408 engine used by both the Night Attack and radar Harrier II+ variants appeared to be basically the same. However when you got to look closer there were a lot more pipes, connections and firewall changes on the radar jet versus the Night Attack jet. Plus there were many more QEC systems and kits to install to make the engine work with the radar jet. Indeed, you had to add the radar package to the common engine to fit it in the Harrier II+. For example, it took about 550 man-hours for a total engine change on a Night Attack aircraft. With the radar jet it was more than 750 man-hours to change the engine.

'The primary ethos of Marine aviation is supportability, maintainability and reliability. As the maintenance control officer I was the quarterback of the squadron, the maintenance scheduler was the centre, the operations officer the coach and the commanding officer the owner of the football team. I was the guy making the passes. We had to have aircraft ready to fly.'

In the late 1990s Lt Col Robert Claypool and a team of US Marine Corps staff officers convinced Lt Gen Frederick McCorkle, Deputy Chief of Staff (DCS) Aviation, to sign an urgent combat capability requirement for an up-to-date FLIR to be integrated with the AV-8B. Crucially, they

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also secured supplemental funding from Congress for this update. After testing the available targeting pods it was determined that the AN/AAQ-28(V) Northrop Grumman Litening II FLIR/laser designation pod was more capable, cost less and was easier to integrate into the AV-8B than other alternatives, and thus it was selected. By 2000 an AV-8B with the Litening II pod mounted on underwing station five, and incorporating modified software, was being tested.

The pod allowed Harrier II pilots to detect and track targets with enhanced precision, greatly reducing the risk of collateral damage, and deliver precision laser-guided bombs from above the range of anti-aircraft fire and shoulder-launched IR-guided surface-to-air missiles. AV-8B Litening II pods were eventually modified with a data link for real time transmission of imagery to ground stations. This new capability was to revolutionise battlefield command-and-control, and make the AV-8B a much-prized intelligence, surveillance and reconnaissance strike platform.

By late 2002 all seven of the US Marine Corps' frontline Harrier II squadrons were equipped with 15 AV-8Bs – usually a mix of ten to twelve radar-equipped Harrier II+s and four to six AV-8B Night Attack aircraft. The US Marine Corps' investment in the higher thrust Pegasus F402-RR-408 engine and improved safety, support and training was about to pay off. Another plus was the procurement of six to eight Litening II targeting pods for each Harrier II squadron, which allowed pilots to identify tactical targets from medium altitudes.

These systems were put to the test during Operation *Iraqi Freedom I* in 2003, which involved no fewer than 76 AV-8Bs. The Harrier II's role in this campaign, and the bloody peace that followed, is chronicled in *Osprey Combat Aircraft 99 – AV-8B Harrier II Units of Operation Iraqi Freedom I-VI*.

This VMA-513 AV-8B+ Harrier 14 has a AN/AAQ-28(V) Northrop Grumman Litening II FLIR/laser designation pod attached to stores pylon No 5. The Litening II pod contains a charge-coupled device television camera, a forward-looking infrared system and a laser spot tracker, rangefinder and designator. Imagery obtained by the pod is displayed on the cockpit CRTs, which allows the pilot to detect and identify targets and employ LGBs and other PGM weapons with pinpoint accuracy. In late 2002 the Litening II pod was fitted with a video data link so the image seen by the pilot could also be transmitted to a 'ruggedised' laptop computer on the ground fitted with an antenna. The real time imagery generated by this system has greatly improved strike effectiveness, since a FAC or battlefield commander can monitor aerial attacks from the ground as if he was sitting in the cockpit next to the pilot (*US Navy*)

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Aside from the Litening II, the US Marine Corps had also acquired additional equipment to enhance the AV-8B's strike effectiveness. The latter included a Global Positioning System (GPS) and the Automatic Target Handoff System (ATHS), which provided the digital exchange of targeting data and imagery between the jet's targeting pod and ground units equipped with a Remote Operational Video Enhanced Receiver (ROVER). The installation of new wiring also allowed the Litening II pod to be carried on centreline station four rather than underwing station five, thus widening the sensor's view of the ground. The freeing up of the underwing pylon allowed additional ordnance or fuel to be carried by the Harrier II.

Continuous software upgrades were also developed and incorporated into the AV-8B's weapons system. This included many Operational Flight Program (OFP) updates ranging from C1.0 in 1999 to C2.0 in 2003, H4.0 in 2006 and H5.0 and H6.0 in 2008. These software upgrades improved the operability of the AN/APG-65 radar and Litening II pod when it came to weapons integration with the many versions of JDAM (including Laser JDAM), the dual mode laser/GPS guided bomb and AIM-120 radar-guided air-to-air missile. The software also created new digital data links that allowed the Harrier II to work more closely with other aerial (both manned and unmanned) and land-based assets. All of these upgrades would be put to the test in the War on Terror from 2002.

Overseeing many of these systems upgrades was Hank Cole, former Boeing AV-8B Programme Manager;

'The AV-8B platform has gone through a significant transformation since the beginning of OEF in 2001 to today. There were two significant capabilities that were incorporated into the aircraft during this period

The full set of equipment that comprises the L3 Remote Operational Video Enhanced Receiver (ROVER III), as used by US Marine Corps FACs and ground commanders to view real time imagery from AV-8Bs, F/A-18s and UASs. ROVER became a critical piece of equipment in the war in Afghanistan since it significantly enhanced situational awareness and command and control (*L3*)

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PGMs on the deck of an amphibious assault ship during a live fire exercise. Such ordnance has allowed AV-8B pilots to strike battlefield targets with pinpoint accuracy. At the bottom are two 500-lb GBU-12 LGBs (blue bodies means that they are inert training rounds), which rely on their target being illuminated by a laser designator – as fitted in the Litening II pod – until impact. Above them are a pair of 500-lb GBU-38 JDAM, which employ an inertial navigation system with GPS updates for precision targeting. When using JDAM, the pilot simply has to enter the target coordinates into the weapon's guidance system and drop the bomb and it will guide itself to impact (*US Navy*)

which made the AV-8B a key asset to the US Marine Corps combat commanders and Allied forces. The first was the incorporation of the Litening II targeting pod, which was identified as a key requirement coming out of Operation *Desert Storm*. The second was clearance to employ the 500-lb GBU-38 JDAM.

'Most of the remanufactured radar aircraft were built with software allowing them to be JDAM-capable, but only the 1000-lb GBU-32 weapon was initially cleared for use by US Navy aircraft. The introduction of the 500-lb JDAM was a much better fit on the Harrier II when introduced to the US Navy inventory, especially aboard ships. This has become the primary smart weapon for the AV-8B strike capability.

'At the start of the conflict, most of the fleet required a retrofit of the MIL STD 1760B wiring modification to utilise the capability. Boeing was tasked with the design and production of such modification kits, and the company also provided field teams to incorporate the capability into the unmodified Night Attack and radar aircraft in the frontline. Boeing later worked in a partnership with the US Navy's Fleet Readiness Centers during the latters' Planned Maintenance Interval activities to continue to install these and other modification kits into the Harrier IIs. The next addition was the 500-lb Laser JDAM, with its great multi-mode capability that allows the weapon to hit moving targets on the ground. The latest upgrade includes a digital improved triple ejector rack [DITER], which adds increased smart weapons carriage by allowing the aircraft to be armed with up to ten 500-lb JDAMs.

'As the programme manager, I was always focused on ensuring that the team at Boeing and industry partners focused on the deployed squadrons, providing technical assistance and support through our field service reps, site reps and the Fleet Support Teams at MCAS Cherry Point and NAWS China Lake. In the end it was a small, integrated team of people, and their desire to support the Marine rifleman in combat, that helped the industry/government group maintain the platform capability and keep the platform relevant. The Harrier II team is focused on ensuring that the aircraft remains capable and supported into the future to its new planned out of service date in 2030.'

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OEF 2001-02

Following the 11 September 2001 attacks on the World Trade Center and the Pentagon, President George W Bush mobilised US forces and secured support from allies for diplomatic and military action against the Taleban government in Afghanistan, which had been harbouring the perpetrators of this atrocity – Osama bin Laden and his al-Qaeda terrorist organisation – since 1997.

Afghanistan is a landlocked Asian country some 600 miles from the nearest coastline. It shares borders with Pakistan to the southeast, Iran to the west, Turkmenistan, Kyrgyzstan and Tajikistan in the north and the People's Republic of China in the northeast. Slightly larger than France, Afghanistan has an area of 250,000 square miles (647,500 sq km), and varied terrain ranging from deserts in the southwest to mountains in the central and northeastern regions. In October 2001, when the US military commenced its War on Terror against the Taleban and al-Qaeda, the population of Afghanistan – a diverse mix of tribal, ethnic and linguistic groups that were regionally located – stood at just over 25 million.

US Marine Corps Harrier II units participating in OEF usually supported troops based in the southern half of Afghanistan. However, VMA-513 flew from Bagram air base during its 11-month tour of duty in 2002-03 (*Brickstreet Creative via author*)

At 2057 hrs local time on 7 October 2001, US and British forces struck at 31 Taleban military and government targets. The 2001 offensive, named Operation *Enduring Freedom* (OEF), saw continuous Coalition air strikes that demolished strategic targets and Taleban defences. At the time there was no way of knowing that this would turn into America's longest running war, with air power supporting operations throughout.

This Afghanistan conflict again underscored the importance of sea-based air power, especially aircraft carrier battle groups and amphibious assault forces. Even after Osama bin Laden claimed credit for the 11 September 2001 attacks, many nations bordering Afghanistan were unwilling to provide air bases or port facilities to support a US-led intervention in the country. Thus,

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the only military assets with the mobility and firepower to wage a sustained campaign against Afghanistan were the US Navy's carrier battle groups, amphibious assault ships and long-range bombers and tactical jets of the USAF, the latter flying from bases in the Middle East.

The aircraft carriers USS *Enterprise* (CVN-65) and USS *Carl Vinson* (CVN-70), and their battle groups, were involved in the opening phase of hostilities. US Marine Corps AV-8B Harrier IIs and helicopters operating from the amphibious assault ships USS *Peleliu* (LHA-5) and USS *Bataan* (LHD-5) also took part in the campaign, as did aircraft and helicopters from the British carrier HMS *Illustrious* (RO6) and the French carrier *Charles De Gaulle* (R91).

USS *Peleliu* (LHA-5) sits at anchor off the coast of Kuwait on 7 January 2002 during a break from its OEF commitments. A US Marine Corps AV-8B detachment with six jets, 100 support personnel and eight to ten pilots regularly deploy as part of the Aviation Combat Element (ACE) within a Marine Expeditionary Unit (MEU) embarked in amphibious assault ships of the US Navy. *Peleliu* was the first amphibious ship to support the Global War on Terror, deploying Marines from the 15th MEU-SOC to Afghanistan. VMA-311 'Det B', which was assigned to HMM-163, operated from LHA-5 between August 2001 and March 2002 (*US Navy*)

As with virtually all modern conflicts involving US armed forces and their NATO allies, aerial refuelling assets played a pivotal role. Without these aircraft, initially provided by the USAF, the RAF and the *Armeé de l'Air*, strike aircraft would not have been able to sustain the long-range operations and carry the heavy weapons loads needed to effectively hit targets in landlocked Afghanistan.

US Marine Corps Harrier II units were among the first US TACAIR assets to be deployed to the region to support OEF. The 15th MEU-SOC had left San Diego, California, on 13 August 2001 for a planned deployment to the Northern Arabian Gulf (NAG). This force included three ships, 2200 Marines, 20+ helicopters and six Harrier IIs from VMA-311. The latter jets formed Detachment B assigned to Marine Medium Helicopter (HMM) Squadron 163 aboard *Peleliu*. Following the 11 September 2001 attack, the 15th MEU-SOC was diverted from an exercise off the coast of northern Australia to the Indian Ocean.

The three ships of the 15th MEU-SOC arrived off the coast of Pakistan in early October, and on the 7th of that same month the unit transferred 350 Marines and several helicopters to Jacobabad air base in south central Pakistan. These forces manned a staging area for search and rescue operations and also maintained a base for US Marine Corps KC-130 tanker transports.

Maj John Thomas was serving with VMA-311 Det B aboard *Peleliu* in 2001;

'I was the maintenance officer for the AV-8Bs assigned to the 15th MEU-SOC during the deployment. I really liked deploying and working off the ship, as flying from an amphibious carrier poses many challenges, and most pilots love challenges. Lt Col James LaVine, who led HMM-163, was great. He was a very smart guy who was fair and supportive of his team. He said "you guys are the fixed-wing experts. Tell me what you can do and we will go forward".

'We were among the first fixed-wing units to arrive on station off the coast of Pakistan, and we were confident that we would be part of the initial waves of tactical aircraft to go into Afghanistan when the war

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started. However, to our surprise and great disappointment, no tasking came down to the 15th MEU's Harrier IIs. We were frustrated and tried to sell ourselves to the Air Component Commander [ACC] in Qatar, informing him that we were a valuable asset that could contribute to the fight. One of the challenges of getting into the fight was the desire by ACC for PGMs [precision guided munitions] to reduce collateral damage. Finally, after much lobbying through our Marine Air Wing back on the West Coast, up the chain and finally to the ACC, we were put in the fight – we were tasked with attacking a terrorist training camp.

'The mission had been scheduled several times but it was cancelled over and over again due either to weather or other factors beyond our control. The flight lead for the mission rotated among the majors in the det, and on 3 November 2001 I was the lead for the strike. Four jets had been allocated to the mission, but one of them went down in the chocks with a technical fault so our planned four-ship turned into a three-ship. Each aircraft had two fuel tanks and four Mk 82 general purpose bombs on the wings. Right after takeoff we refuelled from a Marine KC-130 over the ocean. About 45 minutes later we refuelled again, this time from an RAF VC10 tanker over Pakistan. They had what looked like paper plates in the windows that read, *"Use our gas to kick ass!"* – it was very motivating.

'We subsequently headed into Afghanistan, found our target and dropped our bombs, before heading back to the ship, refuelling once on our way back south. Acquiring the camp and expending our ordnance was pretty easy and not all that exciting, but at least the Harrier IIs were finally now into the fight. Any time you came home "clean" [empty bomb racks] the personnel on the ship got very excited. Later, we learned that the majority of the staff at the CAOC [Combined Air Operations Center] had watched our first mission on their video monitors. They had tracked us as we launched, flew to the tankers, bombed and flew back to the ship. We knew that for us to continue to receive tasking, this first mission had to go off without a hitch, which it did thanks to all of the efforts of our Marine maintainers, as well the ship's crew.'

The pilot of the Harrier II that suffered a technical fault on the flightdeck was Capt Jason Maddocks;

'The three majors from our det and I were assigned the first strike sortie, which was a pre-planned mission against a terrorist training compound.

AV-8B BuNo 164152 of VMA-311 'Det B' accelerates down the flightdeck of *Peleliu* on 3 November 2001 to signal the start of the very first Harrier II mission against enemy targets in Afghanistan on 3 November 2001. Three jets participated in the mission against a terrorist training camp, each Harrier II being armed with two external fuel tanks and four Mk 82 500-lb bombs (*US Navy*)

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It was a proving mission for the AV-8B – sort of a training mission just to show we could take off from the ship, fly all the way into Afghanistan, drop our bombs and get back safely. We jokingly called this mission an "Afghanifam" [familiarisation sorties are referred to as "fam" flights by the US military].

'I completed pre-flighting the aircraft on the flightdeck, and then during my ground checks the jet went down. I had to move over to the backup aircraft, and our Marines transferred all the bombs to this jet. It was the quickest I have ever seen a crew do that. I started the backup aircraft as the other three guys took off and headed for the tanker. Immediately after takeoff my replacement jet lost all comms, so I had to orbit the carrier in order to burn off fuel to get it down to landing weight, drop two of my bombs into the ocean and recover. I duly missed the first mission into Afghanistan!

'The next day, however, I flew my first mission, which lasted 4.1 hours. I was flying one of our radar jets – we had two Night Attack Harrier IIs, two production radar jets and two remanufactured jets – at night, and I still recall how surreal it was to hit the tanker. This was the first time I had tanked on NVGs and the first time I had tanked off a KC-10. Rendezvousing at 30,000 ft, we had to toboggan to maintain airspeed due to our altitude and high gross weight. I was only a few hundred pounds away from bingo [no fuel], so it was an exciting experience!

'After the first missions, we started carrying two Mk 82s and two GBU-12 500-lb LGBs [laser-guided bombs] on each jet for increased flexibility. We would rely on the ground FAC [Forward Air Controller] or another aircraft for laser designation. On all of my missions where I dropped an LGB, a ground FAC had designated the target for me. Flying CAS missions for Special Forces, we were still able to perform effectively despite not having a Litening II FLIR/laser designation pod. It was just more of a coordination challenge without the latter.

'We achieved outstanding time on station in the CAS stack compared to other aircraft. We would pre-mission tank in southern Afghanistan, go to the holding stack, be assigned a kill box with a ground FAC and still be able to provide more than 60 minutes of loiter time despite carrying four bombs because the AV-8B had large external fuel tanks that were originally designed for ferrying rather than for combat.

'The ROE [Rules of Engagement] kept us above 20,000 ft AGL [above ground level] so as to limit our threat exposure, and we could descend to 15,000 ft for weapons delivery. Since we did not have a targeting pod, we had to dive, acquire the target in the HUD [Head-Up Display] and perform a gentle dive toss with our bombs in order to stay above the 15,000 ft hard deck. We were pretty accurate despite this, and performed some effective CAS. Most of our heavy strike missions were flown in early to mid November.'

This VMA-211 'Det B' jet (BuNo 164142), photographed on 24 December 2001 being taxied into position for take off from the flightdeck of *Peleliu*, is armed with both a 1000-lb BLU-110 'dumb bomb' (the largest warhead employed by the Harrier II) and a 500-lb GBU-12 LGB beneath its right wing (*US Navy*)

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Pilots and maintainers from VMA-311 'Det B' pose for a photograph on the flightdeck of *Peleliu* on 22 January 2002, the unit having completed its OEF missions earlier that month. The Harrier II that forms the backdrop for this photograph (BuNo 164566) would be flown in combat by VMA-311 'Det A' over Iraq from *Tarawa* in March-April 2003 during OIF I (*15th MEU-SOC*)

By late November *Peleliu* had become a dedicated 'Harrier carrier', as Maj John Thomas recalled;

'Several weeks into the war the rotary-winged squadron and the Battalion Landing Team (BLT) transitioned to shore-based operations in Afghanistan at Forward Operating Base [FOB] Rhino, essentially turning *Peleliu* into a "Harrier carrier" and minimising flightdeck competition issues. By this time we had a fairly routine flight schedule, and we would fly a mix of day and night missions, launching a four-ship twice daily or a staggered four-ship twice daily on on-call CAS for ground units.'

Generally, two missions were planned per day, each with four aircraft and a spare assigned – with only six jets embarked, the detachment relied heavily on its maintenance personnel to keep the hardworking Harrier IIs fully operational, thus ensuring the effectiveness of VMA-311 as a fighting unit. One mission was flown in the morning and a second in the afternoon, extending into the evening. Shortly after takeoff the Harrier II pilots rendezvoused with a USAF or RAF tanker to refuel, before heading north into Pakistan and tanking for a second time just prior to entering Afghan airspace. Once over Afghanistan, the formation would usually split up into two sections of two aircraft and fly strikes in support of Coalition forces on the ground. After about an hour in the combat zone delivering bombs or undertaking armed reconnaissance, all four jets would fly south into Pakistan, refuel, and then head back to the carrier for a vertical landing. Most missions lasted from five to 5.5 hours and covered a distance of 500 to 800 miles.

A VMA-311 'Det B' AV-8B Harrier II+ armed with GBU-12 LGBs takes on fuel from an *Armée de l'Air* C-135FR of *Groupe de Ravitaillement en Vol* 93 'Bretagne' over southern Afghanistan on 9 December 2001. Aerial refuelling has been critical to the effective employment of Coalition air power throughout OEF, and this was particularly the case during the early stages of the campaign. VMA-311 'Det B' jets refuelled from USAF, RAF and *Armée de l'Air* tankers during the unit's time in-theatre in 2001-02 (*VMA-311*)

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Nearly non-stop pounding from the air soon weakened the Taleban's defences, opening the way for a successful ground assault by the Northern Alliance assisted by Coalition Special Forces. By late October 2001 the Taleban were starting to crack under the pressure, allowing the Northern Alliance to enter Kabul on 12 November. Two weeks later the defences around Kunduz were also breached.

Aside from targeting the Taleban and al-Qaeda, US Marine Corps Harriers IIs flying off *Peleliu* and *Bataan* also provided air support for the helicopter insertion of Marines into Afghanistan. As previously noted in this chapter by Maj Thomas, on 25 November six CH-53Es carrying a reinforced rifle company flew 441 miles from their ship and established FOB Rhino at a desert airstrip south of Kandahar. CH-53Es continued the inflow of troops and gear until the runway had been repaired and approach lights had been installed so as to allow KC-130s filled with Marines and tactical vehicles to operate safely from the FOB.

While this was going on, VMA-311 Det B continued to fly its long-range missions into Afghanistan, with Maj Thomas in the vanguard of the operation;

'For OEF missions, I liked flying the radar jet better than the Night Attack jet as the radar gave you better situational awareness and helped when it came to rendezvousing with the correct refuelling tanker. Conversely, the radar-equipped Harrier II is a heavier aircraft, and therefore has less performance. If you flew the lighter Night Attack jet you could usually bring your bombs back aboard the ship if they had not been expended. We nearly always had four jets available for missions from the six in our detachment.'

In mid November the 26th MEU-SOC, originating from Camp Lejuene, North Carolina, joined the 15th MEU-SOC off Pakistan. The unit's aerial firepower was provided by six Harrier IIs from VMA-223, which had embarked nine pilots and associated support personnel as part of HMM-365 in *Bataan*.

'When *Bataan* arrived its AV-8B pilots came over to *Peleliu* and we briefed them on our operations', explained Maj Thomas. 'The Harrier IIs on *Bataan* started off covering the day schedule and we covered the night, but after they came up to speed we rotated day and night missions as required'.

Capt Jason Maddocks was also involved in getting VMA-223's six-jet detachment briefed on OEF procedures;

'As we were the first AV-8B unit on station, it was up to us to conduct a face-to-face brief with Maj Mark Werth and his det onboard *Bataan* when they arrived off Pakistan. They flew missions at the same time as we did, and there was a bit of an overlap where we flew together. Also, in mid December 2001 we flew sorties with the Italian Navy AV-8Bs off their carrier, the *Garibaldi*.'

Marines assigned to VMA-311's 'Det B' perform regular maintenance on a Harrier II in *Peleliu's* hangar bay on 23 November 2001. Although a little cramped, maintenance in such an environment would prove to be luxurious in comparison with the forward bases that Marine Air units would subsequently call home in the early years of OEF (*USMC*)

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Capt Jason Maddocks of VMA-311 'Det B' carefully inspects his AV-8B prior to flying a mission over Afghanistan in support of OEF on 2 November 2001. He was due to participate in the historic first strike of the campaign 24 hours after this photograph was taken, but both his primary jet and the replacement aircraft he then took off in suffered technical failures, causing him to abort the mission (*US Navy*)

At approximately 2300 hrs on 22 November Harrier II pilots from VMA-223 began flying regular strike missions over Afghanistan. The unit conducted the bulk of its sorties over the corridor from Lashkar Gah, through Kandahar and down to Quetta, near the border with Pakistan.

Even with the arrival of VMA-223, the AV-8B strength during the opening phase of OEF was modest. 'We were only a tiny element of the air war in 2001 – between the two units, we only ever had ten aircraft at most ready to fly at any one time, and I am sure we only made a small contribution, since we were limited in our mission effectiveness by not having a targeting pod', Capt Maddocks recalled. 'However, I think we demonstrated that the V/STOL AV-8B could perform similar missions to the Hornet off the big deck aircraft carriers, providing great time on station with several weapons per aircraft to support the ground FACs. Our biggest accomplishment was that we fought the political battle to get the Harrier II into the fight and then showed its effectiveness, and I think this paved the way for future AV-8B deployments in both OEF and OIF.'

According to Maj Thomas, he flew his 'last combat mission over Afghanistan on 31 December 2001, and by this time I hadn't dropped any ordnance for weeks. In mid January 2002 we headed home, stopping off in Australia for re-supply and Rest & Recreation. Although we had been gone a total of seven months by the time we got back to San Diego, it had been both exciting and rewarding to be a part of such an operation'.

With VMA-311 gone, VMA-223 assumed responsibility for Harrier II operations in OEF. The *Bataan* detachment was led by Maj Mark Werth;

'The Marines of the VMA-223 rose to the occasion in the opening days of OEF. I could not have been more proud of them. They deployed into harm's way just seven days after the nation had been attacked. They are true heroes and I will forever be indebted to them for their sacrifice.

'For Thanksgiving, I enjoyed a turkey dinner in the *Bataan* stateroom and then manned up for

VMA-223 'Det A's' AV-8B BuNo 165385 performs a training mission from *Bataan* while en route to the Arabian Sea in late 2001. The six Harrier IIs assigned to the detachment were part of HMM-365, which was in turn controlled by the 26th MEU-SOC embarked in LHD-5. Once in-theatre, the AV-8B pilots from VMA-223 flew most of their early missions over Afghanistan at night. These were long sorties that usually lasted in excess of five hours, jets having to fly from the ship to Afghanistan via Pakistani airspace. They were then tasked with hitting targets, before repeating the long flight south to the carrier. Multiple visits to tankers were required for each round trip, as there were no bases then available to Coalition strike aircraft in Afghanistan (*M Werth*)

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Aviation Boatswain's Mate 3rd Class Olisakwe Anchonye directs the pilot of AV-8B BuNo 165385 from VMA-223 'Det A' through a quick pre-flight check prior to the jet launching on an OEF mission from the flightdeck of *Bataan* on 8 January 2002. Note that the aircraft is not armed with centreline gun pods – rarely seen due to their excessive weight during the long missions flown from the Arabian Sea. It is, however, carrying the obligatory 300-gallon external fuel tanks, with ordnance outboard of them (*US Navy*)

what would be nearly a 5.5-hour sortie, with three hours of time on station near Tarin Kowt. My wingman, Capt Dwight DeJong, and I followed several convoys that night. The night attack and radar capabilities of the Harrier II+ gave us a significant advantage over the enemy who had poor tactical discipline. When we finished our sortie, debriefed intelligence and returned our weapons to the armoury, it was time for a Friday morning breakfast. That Thanksgiving mission was the first in what would become an every other night cycle for the detachment pilots from VMA-223.'

Capt Nathan Berryman of VMA-223 created history during the early OEF missions undertaken by the unit, as he described in a US Marine Corps media release from late November 2001;

'I became the first VMA-223 pilot to drop a bomb in combat since 1969. It was near the end of a six-hour mission. We had 20 minutes left on station when I was surprised to hear the FAC clear us weapons free on a target. Two F-14Ds [from VF-213] with LANTIRN Targeting System pods were on station, and they had detected an enemy vehicle convoy and passed this information onto the ground FAC. The Tomcats each made a pass, destroying two vehicles in the convoy. My wingman and I coordinated with them so that they could lase the convoy. My bomb hit the target. I felt proud that the Marine Corps could provide this kind of support hundreds of miles from the ship.'

According to Maj Werth, 'for the first 30 days of 26th MEU-SOC Harrier II operations in Afghanistan, missions were flown exclusively at night. The ship flightdeck cycle between the CVNs and LHA/LHDs were arranged so as to provide 24-hour air support over southern Afghanistan. And this became increasingly important when the numbers of US troops on the ground in FOB Rhino increased. As the flight ops shifted to support the seizure of Kandahar International Airport by Task Force 58 in December, the 26th MEU-SOC air support sorties moved to daytime. Finally, when the 26th MEU-SOC moved ashore into FOB Rhino, the rotary-winged element of HMM-365 went with the troops. *Bataan* was now 450 nautical miles from the Marine Expeditionary Brigade's operating area, which proved to be too far for anything other than fixed wing

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An aviation boatswain's mate signals 'Okay for launch' to the pilot of AV-8B Night Attack aircraft BuNo 163876 aboard *Bataan* on 8 January 2002. The VMA-223 'Det A' jet is carrying two 300-gallon external tanks, two 1000-lb GBU-16 LGBs and an AIM-9M air-to-air missile beneath its wings. The aircraft also has two small red bomb symbols painted beneath the cockpit, denoting ordnance expended on a previous mission (*US Navy*)

operations with aerial refuelling capabilities. With most of the helicopters ashore, *Bataan* enjoyed additional flight operations flexibility to support Harrier II sorties any time, day or night.'

The final phase of the opening round of OEF in 2001 was the hunt for Osama bin Laden and his al-Qaeda leadership group in the Tora Bora region of eastern Afghanistan in December. US Special Forces and Afghan militia worked to surround the suspected hideouts, while US Navy P-3Cs and Predator drones watched from above. Despite the heavy application of air power (which included the Harrier IIs) and an intensive search on the ground, bin Laden and many of his senior advisers were able to escape into Pakistan.

As 2001 came to an end, US Marine Corps troops in Afghanistan were progressively replaced by soldiers of the US Army's 101st Airborne and 10th Mountain Divisions and Coalition forces. In late December the 15th MEU-SOC departed FOB Rhino and returned to *Peleliu*, before heading home. The following month the 26th MEU-SOC also departed Afghanistan for *Bataan*, the vessel returning to its homeport of Naval Station, Norfolk, Virginia, in April.

Pilots assigned to VMA-223 'Det A' pose for a photograph beneath one of their jets, which is also marked with a single bomb symbol to the left of the unit emblem. These men are, from left to right, Capts Enrique Bougeois and Joe Sinelli, Maj Mark Werth, Capts John Ferguson, Chris Raible, Dwight De Jong, Bers Brennan and Nate Berryman and Maj Dan Spano (*M Werth*)

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OEF 2002-03

By early 2002 both the Taleban and al-Qaeda were on the run in Afghanistan, with the remnants of their forces having escaped into neighbouring Pakistan or the semi-independent border area in the east of the country. Although having suffered serious losses and been removed from power, the Taleban remained undefeated. Indeed, during the course of 2002 they prepared to counter-attack US and Coalition forces in Afghanistan just as the latter were starting to focus on stabilising the country by feeding the Afghan people, rebuilding Afghan infrastructure and creating a new police force and Afghan National Army (ANA).

From December 2001 through to June 2002 the 13th MEU-SOC embarked in USS *Bonhomme Richard* (LHD-6), with a six aircraft detachment of Harrier IIs from VMA-211 being assigned to HMM-165 aboard the vessel. The ESG arrived off the coast of Pakistan in mid January 2002, replacing *Bataan*.

Maj Michael Gough was the Harrier II detachment commander within HMM-165 during the 2001-02 deployment;

'We were scheduled to deploy in mid-December, but as a result of the attacks of 11 September 2001 our date for deployment was accelerated to the 1st of the month. We pulled out of San Diego harbour aboard *Bonhomme Richard* with six aircraft, nine pilots and one maintenance officer embarked, ready to support whatever tasks we were assigned. By the time we arrived off the coast of Pakistan fighting against the Taleban had tailed off.

'Having initially been briefed by VMA-223 on recent operations in-theatre, Capt Josh Luck and I flew the detachment's first mission over Afghanistan with two pilots from *Bataan*, who showed us the ropes. We went up to northeast Afghanistan, flew CAS and then returned to *Bonhomme Richard*. A few days later *Bataan* left and we flew regular missions into Afghanistan from 18 to 24 January. Things were very quiet in country, so in mid February LHD-6 sailed south to participate in Exercise *Edged Mallet* in Kenya.'

Coalition forces in Afghanistan increased to more than 10,000 troops during the first two months of 2002 as an offensive was planned to knock out the remaining pockets of Taleban and al-Qaeda resistance in the eastern part of the country. Most of the fighters were holed up in the mountainous Shah-i-Kot region, south of Gardez in the Paktia province. In what would eventually become the first major land battle of OEF involving a large number of American troops, the US

Four AV-8Bs from VMA-211 'Det A' sit chained to the flightdeck of *Bonhomme Richard* on 20 January 2002. There are pilots strapped into the two jets furthest from the camera, and these machines will soon be unchained, marshalled out and sent aloft on the unit's next OEF mission. All four aircraft are armed with GBU-16s. Assigned to HMM-165 as part of the 13th MEU-SOC, 'Det A' was embarked in LHD-6 on deployment from 1 December 2001 to 18 June 2002 (*US Navy*)

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A VMA-211 'Det A' jet takes on fuel from an RAF Tristar KC 1 of No 216 Sqn over northern Pakistan on 12 March 2002. Harrier II pilots would top off their tanks at least three times during a typical OEF mission flown from an LHA or LHD. Tristars of No 216 Sqn were a regular sight for 'Det A' during its time in-theatre, the RAF unit flying jets in support of Operation *Oracle* (the RAF's codename for OEF) from its detachment base at Bahrain's Manama airport. Indeed, No 216 Sqn had the distinction of being the first Coalition tanker asset to enter Afghan airspace (*USMC*)

Army's Task Force Mountain, consisting of 2000 soldiers from the 10th Mountain Division and the 101st Airborne Division, together with Coalition and ANA soldiers and Special Forces units, commenced Operation *Anaconda* against more than a thousand hardcore enemy combatants on 2 March. Bad weather blighted the offensive from the start, and Coalition forces suffered serious casualties despite heavy air support as entrenched al-Qaeda fighters shot down a MH-47 Chinook and badly damaged several other helicopters.

Bonhomme Richard recommenced OEF missions following the launching of *Anaconda*, as Maj Gough explained;

'HMM-165 flew some AH-1Ws and CH-53s into Bagram to help Coalition operations in the high mountains in an area called the "Whaleback", in the Shah-i-Kot Valley, where SEALs and US and Coalition forces had seen some heavy fighting and suffered losses. We stayed off Afghanistan from 6 to 28 March, our jets flying numerous missions in support of the fighting associated with Operation *Anaconda*.

'Having departed the ship, we would fly through Pakistan and head for our first refuelling point near Kandahar, in southern Afghanistan. Fuel was a constant worry. When we got to the refuelling point, or were coming off a strike and needed gas, you always hoped that the tanker would be there and that the fuel transfer would proceed smoothly. At times the jet got pretty close to "bingo" fuel when you had only one more chance to get the probe into the basket for gas, or it was off to Jacobabad, in Pakistan, to land ashore. We flew many long missions ranging in length from six hours to 7.5 hours. Many missions commenced at night and extended into the day or, conversely, started in the day and went into the night.'

Maj Thomas Gore was amongst the pilots from VMA-223 who expended precision-guided ordnance during *Anaconda* despite the unit's AV-8Bs lacking their own targeting pods;

'On this cruise we had no Litening II targeting pods because they were just arriving in the fleet, and we did not have enough time to train with them prior to our deployment. Fortunately, the Harrier II is a very accurate "iron" bomber, for occasionally the terminal controller, either in the air or on the ground, did not have a laser designator for our GBU-12 LGBs. When this happened we simply dropped the bombs in unguided mode, and mainly had an excellent effect on the targets. Most of the time, however, our GBU-12s received the precision laser designation that they required from other aircraft or ground units.

AV-8B Harrier II+ BuNo 165397 from VMA-211 'Det A' prepares to go 'feet wet' as it approaches the coast of Pakistan at the end of an OEF mission on 15 March 2001. By this stage in the sortie the aircraft would have flown more than 600 miles and been aloft for close to five hours. When supporting OEF US Navy carriers typically sail some 70 miles off the coast of Pakistan (*USMC*)

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'Overall, in early OEF, we flew the types of missions that all attack pilots dreamed about – long, demanding sorties in support of ground forces, day and night, followed by shipboard recoveries.'

In late March, with *Anaconda* now over, LHD-6 sailed east for another exercise, before heading home. By then USS *Wasp* (LHD-1), with the 22nd MEU-SOC embarked, had relieved LHD-6 off the coast of Pakistan. HMM-261 was operating from the flightdeck of LHD-1, the reinforced unit including a detachment of six Harrier IIs from VMA-542.

USNS *Supply* (AEO-6) delivers nearly 65,000 lbs of fuel to USS *Wasp* (LHD-1) during an underway replenishment off the coast of Pakistan on 17 July 2002. *Wasp* deployed with the 22nd MEU-SOC/ HMM-261 embarked, the latter unit including six AV-8Bs from VMA-542 'Det A' within its ranks. On cruise from 22 February to 30 August 2002, *Wasp* and its Expeditionary Strike Group participated in several exercises, aside from supporting OEF (*US Navy*)

The most significant aspect of this deployment for the Harrier II community was the fact that the jets aboard LHD-1 were giving the Litening II FLIR/laser designation pod its combat debut with the AV-8B. Capt Michael Perez was one of the pilots assigned to VMA-542, and he recalled;

'We had been the first squadron to perform operational testing and training with the Litening II pod in preparation for our 2002 OEF deployment. The VX-9 test guys came to the squadron and introduced the Litening II pod to the Harrier II fleet, after which we conducted an exercise to expand our skills at the Marine Corps Air Ground Combat Center [MCAGCC] at Twenty-Nine Palms, in California, in late 2001. We learned "on the job" about this new system in the run up to the deployment, as the unit had no operating manuals nor support documentation on how the AV-8B worked with the pod – we had to develop these as we went along. Since it was new to all of us we used pretty simple tactics that saw us either self- or buddy-lasing targets.

'Fortunately, we did not have to learn delivery profiles for a wide range of ordnance, as at that early stage in the pod's association with the Harrier II the jet had only been flight tested with a small number of load options. Indeed, we could only carry the Litening II pod under one wing and a solitary GBU-16 1000-lb LGB under the other. Our hurried integration with the pod made the AV-8B's weapons system think the jet was carrying a Laser Maverick rather than a targeting pod, so it could only be uploaded under the wing, usually to station five – the inner pylon beneath the right wing. At this time we had the C1 software installed in the AV-8B, which was not a higher order language. To have added carriage of the Litening II pod to the system would have meant rewriting the AV-8B's Operational Flight Program software.

'We had so few pods available that one jet carried the pod and fuel tanks while the wingman carried bombs – usually two GBU-12s – and fuel tanks.

'As we were the first AV-8B pilots to fly with the Litening II pod and deploy with a self-designation PGM capability, we were very much aware of the responsibility we had since there would be many eyes watching us on this deployment. Embarked in *Wasp*, we sailed from

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Aviation Boatswain's Mate 3rd Class Cordell Allen gives Capt Toby Buchan of VMA-542 'Det A' permission to launch his Harrier II from the flightdeck of *Wasp* on 23 May 2002. The most significant aspect of this deployment for the Harrier II community was the fact that the jets aboard LHD-1 were giving the Litening II FLIR/laser designation pod its combat debut with the AV-8B. Indeed, the sensor head of the pod fitted beneath the right wing of this aircraft can be seen to the extreme left of the photograph (*US Navy*)

Naval Station Norfolk in February 2002. It was less than six months after "9-11", and we thought we would head directly to the Arabian Sea and fly missions over Afghanistan with our new Litening II pods. Instead, we sat on alert for a week in support of Operation *Southern Watch* [OSW] in the NAG, although we were never actually called on to fly over Iraq. Eventually, from there, we got orders to head east.

'We operated off the coast of Pakistan for several weeks, flying day missions only from the boat. My first OEF sortie lasted eight hours, and I had to meet up with an RAF Tristar tanker five times during the course of the mission, as we were patrolling to the west of Kandahar.

'Flying jets equipped with both a Litening II pod and LGBs, we were able to develop new tactics that made the best use of the aircraft's improved avionics and weapons systems. We effectively built on what VX-9 had taught us about the Litening II pod pre-cruise, and the tactics and techniques we adopted on this deployment later became standard for all AV-8B units in the fleet. The 22nd MEU-SOC deployment to OEF in 2002 was effectively a prototype of what the Harrier II could do with new systems, the jet's integration with the Litening II pod and LGBs continuing the evolution of capabilities for the AV-8B.'

LHD-1 returned to Virginia in late August 2002, its ESG having sailed nearly 95,000 miles during the six-month deployment.

By mid October US Marine Corps Harrier IIs were again flying over Afghanistan, but this time they were shore-based rather than flying from a ship. A detachment of six AV-8B Night Attack aircraft, ten pilots and more than 180 support and security personnel from VMA-513 and Wing Support Squadron 373 deployed from MCAS Yuma to Bagram, Afghanistan. The squadron's mission statement, according to its XO, Maj Michael Franzak, was to 'deploy for a period of approximately 180 days to conduct expeditionary-based air support for the Coalition Forces Air Component Commander. Put simply, we were sent to Afghanistan to support the grunt. To provide air cover – a protective blanket – over soldiers as they patrolled the inhospitable Hindu Kush'. VMA-513's 180-day deployment would subsequently be extended to almost a year in-theatre.

The unit was led by Lt Col Jim Dixon throughout its time at Bagram;

'I was sent over to Afghanistan and performed a site survey to see if we could operate the Harrier II there. Bagram – an old air base located about 35 miles north of Kabul that had been used by Soviet forces during the Russian-Afghan War – was to be our home. With the base at an elevation of 4900 ft, I chose to take all of my squadron's Night Attack Harrier IIs as this variant is 1000 lbs lighter than the AV-8B+ – our mission in OEF was to be ground attack, since there was no air-to-

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air threat that required the radar. The superior engine performance of the -408 motor at that altitude with the ordnance loads that we were bringing back – a 1000-lb GBU-16 LGB and our 25 mm gun and 300 rounds of ammunition – as well as the Litening II pod and fuel tanks made the Night Attack jet the obvious choice.'

Maj Franzak flew one of the six AV-8Bs from Yuma to Bagram, arriving in-theatre on 15 October 2002;

'After rolling out to the end of the runway, which was in such poor condition that it had to be constantly repaired, the aircraft turned onto a perpendicular taxiway lined with active minefields left from the Soviet occupation and continued past the visual remnants of a war that has ravaged this country for many years. Numerous abandoned MiGs and Sukhoi aircraft lay overturned as heaps of junk throughout the base. Burned out tanks, trucks and armoured personnel carriers littered Bagram's infield.'

The officer cadre of VMA-513 pose for a group photo on the Bagram ramp midway through the unit's 11-month tour of duty at the base. Squadron CO, Lt Col Jim Dixon, is kneeling in the middle of the front row (*A Heino*)

Flying alongside eight Bagram-based USAF A-10As (see Osprey Combat Aircraft 98 – *A-10 Thunderbolt II Units of Operation Enduring Freedom 2002-07* for further details), the Harrier IIs provided CAS for Combined Joint Task Force (CJTF) 180. Formed in June 2002, the latter was tasked with 'conducting operations to destroy remaining al-Qaeda and Taleban command-and-control elements in Afghanistan, as well as other hostile anti-Islamic Transitional Government of Afghanistan [ITGA] elements. CJTF-180 also trained the ANA and conducted/directed information operations, civil military operations and humanitarian assistance operations in coordination with the ITGA in order to establish a stable and secure Afghanistan able to deter/defeat the re-emergence of terrorism'.

CJTF-180 initially struggled to get the best out of its Bagram-based fixed-wing CAS assets, as Lt Col Dixon explained;

'It took us a while before CJTF-180 at Bagram figured out that the aeroplane with the dedicated targeting pod that could see in the dark was flying daylight missions while the A-10, which had to rely on either flares or the inferior infrared sensor in the Maverick missile to find targets, was patrolling at night. Mission assignments were soon swapped around, which meant that during the year we were in-theatre VMA-513 flew more than 1800 hours at night – overall, the unit tallied 3700 flying hours from Bagram.

Litening II pods were still in short supply when VMA-513 deployed to Bagram in October 2002, and typically only the lead jet in a two-aircraft section would be equipped with one when flying a patrol. In this photograph, taken from a KC-10 on 29 January 2003, the lead aircraft has a single 1000-lb GBU-16 to counteract the 440-lb weight of the Litening II pod. The trailing jet is armed with a 500-lb GBU-12 and a LAU-10D/A rocket pod (*USAF*)

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'By the time we went to Afghanistan the heavy fighting was done. CJTF-180 was now busy conducting mopping up operations, trying to "root out pockets of evil". Our job was to support the various isolated firebases throughout the country. We had been told pre-deployment that we were going to Afghanistan to provide air support for CJTF-180, which meant CAS, escort and armed reconnaissance. Thanks to our jets being equipped with Litening II pods, we found that our missions shifted from CAS to reconnaissance because we had the ability to see through the night very well. So we ended up with three major missions – CAS, escort for helicopters, C-130s and ground convoys and reconnaissance.

'Many of our missions were reactive in nature, with jets already airborne on patrol being called over to help out troops that were coming under fire. The three different times I dropped ordnance were all reactive strikes. On the first occasion this happened my wingman and I were undertaking a typically quiet mission when we received word that a firebase in the south was getting shot at, so we raced down there to help them out. The second time I went out to drop was in support of an "insert". Ground forces wanted to sweep a valley for enemy fighters, and we went in and bombed ahead of their sweep. Finally, the last time I expended both LGBs and cannon rounds was in support of SEAL team "Malice" near Lwara, on the border with Pakistan. SOF personnel had tracked several militants that had just attacked FOB Orgun-e to a small outpost. My wingman and I came off the tanker and went to help them out, hitting the target with two strafing runs. We also dropped a GBU-16.

'Ninety percent of the missions that we dropped on over there were reactive, with friendlies taking mortar, RPG or small arms fire.

'We flew our jets in two configurations. The lead aircraft was in "Hunter" configuration, carrying a Litening II pod, a GBU-16 1000-lb LGB, the gun and two external fuel tanks. The wingman's jet was in "Killer" configuration, being armed with a GBU-12 500-lb LGB under each wing and the cannon, and it also carried two external fuel tanks. Later, we replaced one of the GBU-12s with a pod of 5-in Zuni rockets, thus giving our customers a greater selection of weapons to choose from.

'We experienced masking problems with the FLIR pod, its field of view being blocked by the fuel tanks and gun pod. Pilots got around this by adopting interesting cooperative tactics, especially in mountainous terrain. We used the gun about 40 percent of the time. Early on we had some gun issues, and we had two that failed to operate, but we fixed these. The Gatling gun is a pet peeve of mine – you get a lot of commanders that want to pull the guns off the aeroplane because it's extra weight, drag and training evolutions, but you cannot go out on a three-hour CAS mission with just a single bomb and no other option. You drop the bomb and you are done, other than to fly low and scare them.'

VMA-513's hardworking maintainers conduct an engine change on AV-8B BuNo 163868 in the squadron's temporary hangar at Bagram. The lifting power was provided by a mobile crane flown in specially for the job. The Harrier II support team (both military and civilian) put in many maintenance hours per flight hour to keep the jets ready for action (*A Heino*)

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Although VMA-513 had deployed with just six aircraft, as previously noted by Lt Col Dixon, the unit flew in excess of 3700 hours between October 2002 and September 2003. 'Normally with six aircraft, you are going to fly 100 to 120 hours per month', Lt Col Dixon explained. 'You might be able to surge something over that, but in Afghanistan we had several months where we pushed close to 500 hours with the six jets. I had grown up in the AV-8B community, and it was my belief that the jet had the ability to cope with this heightened operational tempo as long as we could find a way to organise turning wrenches to keep the aircraft serviceable, and that someone was willing to give us enough spare parts.

Maj Andrew Heino receives fuel from a a USAF KC-10 tanker during a mission over eastern Afghanistan on 10 November 2002. Despite nearly always carrying external fuel tanks, AV-8B pilots often made repeated visits to a tanker to extend range/payload in order to provide longer periods of CAS for ground forces. Extra fuel was also often needed after jets had had to fly around weather fronts that frequently blighted operations in Afghanistan (*A Heino*)

'Fortunately, we took with us a 16-aeroplane or full squadron parts supply and extra support personnel. Thanks to the pre-deployment site survey we also knew that we would need a lot of extra tyres because of the rough condition of the runway and taxiways – FOD [Foreign Object Debris] would pose constant challenges. We faced other problems too, including the premature wearing out of landing gear struts. However, we were able to fix these despite being at the end of a long supply chain. Another problem, which we were surprised by, was a spate of ECS [Environmental Control System – provides air supply, thermal control and cabin pressurisation] failures with our jets. We had some conference calls with Boeing to find out what was happening and they sent Larry Lively, an AV-8B product support expert, over to Afghanistan to join us and help figure the problem out. To cut a long story short, US Naval Air Systems Command, the squadron maintenance personnel and Boeing worked together and fixed the problem.'

Maj Andrew Heino served as operations officer for VMA-513 during its deployment to Bagram. Appropriately, he was the first pilot in the unit to employ ordnance in OEF, as he explained;

'When we arrived in Afghanistan most of us pilots really had our "fangs out", but we flew for more than a month before my wingman and

Capt Jarret Stricker leads Lt Col Michael Franzak during a dawn patrol along the Afghan-Pakistan border near Khost on 14 July 2003. 'Joliet 03' (BuNo 163868) has a 1000-lb GBU-16 LGB shackled to its inner left wing pylon and its fin tip has been painted in the colours of the Arizona state flag (*M Franzak*)

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I became the first to provide CAS and deliver ordnance. On a dark night in November 2002, Capt "Wiz" Warlock and I were preparing to launch on an XCAS [airborne on call CAS] mission. Shortly before we took off we received a radio call from "Tombstone" [USAF-run Air Support Operations Center responsible for planning and coordinating CAS missions in support of ground forces] tasking us to take off immediately and head to firebase Lwara, near the Pakistani border. It was under mortar attack from Taleban fighters.

'During the 20- to 30-minute flight we "bustered" [aviation slang term for going as fast as possible] to get to the firebase. During the transit we could hear the section of A-10s that was already on station there being cleared hot to deliver ordnance. When we checked in with the Joint Terminal Area Controller [JTAC] assigned to the US Army unit at Lwara, he told us that they were still under mortar attack. After being given a modified nine-line CAS brief [formal brief given by the JTAC, FAC or FAC(A) to aircraft to allow them to conduct a CAS attack. The nine-line consists of nine lines of information containing specific details on how to attack the enemy without accidentally engaging any friendly forces. The nine-line is standardised throughout US forces and is designed to be brief so that targets can be engaged both quickly and effectively] on where the friendly forces were positioned in relation to the enemy, we ran an attack on the mortar position utilising the Litening II targeting pod.

'After an aborted run, we "lased" the target and dropped a 1000-lb GBU-16. Moments later the JTAC told us that a forward observer had reported a direct hit on the enemy mortar position, silencing it. We were pretty excited because that was our squadron's first attack in Afghanistan, and we had achieved a direct hit. It was also the first time that the Litening II targeting pod had been used in combat by VMA-513.

'We subsequently enjoyed great success with the Litening II in Afghanistan. The capabilities that the pod gave us both during the day and at night made us highly desirable to the ground units requesting air support. We had a great relationship with the ground combat units. My older brother was fighting in Afghanistan while I was there – he was a US Army Special Forces Operational Detachment A Team Commander. Although I supported several of his friends and their teams in Afghanistan, I never got the opportunity to support my brother's team in combat. We did see each other a few times when he came to Bagram, however.

'As Marines, we were very used to providing CAS for our brother Marines on the ground. While we were in Afghanistan there were no Marine Corps ground combat units in-country, so we supported US Army Infantry Brigades and Special Operations Teams, US Navy SEALS and Coalition ground combat

Lt Col Franzak and his wingman head back to Bagram at the end of a dawn patrol. According to Franzak, 'dawn patrol missions, flown from slightly after midnight until shortly after sunrise, became gruelling over time and took their toll on me'. Franzak and his wingman Capt Mike Trapp were awarded DFCs for supporting Special Forces Team ODA 2056, which had been ambushed near Dae Chopan on 25 August 2003. They were the first Harrier II pilots to receive the award since Operation *Desert Storm* (*M Franzak*)

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Capt Aaron Haug breaks to the west over the Hindu Kush on 24 November 2002. According to Lt Col Franzak, VMA-513 was specifically deployed to Bagram 'to provide air cover – a protective blanket – over soldiers as they patrolled the inhospitable Hindu Kush'. Franzak described this view as 'an endless panorama of snow-covered peaks'. The squadron deployed exclusively with Night Attack jets to OEF in October 2002 as they were lighter than the radar-equipped Harrier II+, and thus provided additional operational capability and increased ordnance bring back margins in the 'hot and high' conditions experienced at Bagram. This particular aircraft is carrying two 300-gallon fuel tanks, a LAU-10D/A rocket pod (containing four 5-in diameter Zuni rockets) and a GBU-12 LGB. It is also equipped with 25 mm gun pods (*M Franzak*)

infantry, special ops and mechanised units. It was strange supporting the Rumanian mechanised battalion, which operated Soviet BMP and BTR armoured personnel carriers that we had regularly studied in our threat recognition training during the Cold War.

'We only dropped 17 bombs in a year of fighting in Afghanistan. With most of the action happening after dark, we all wanted to fly night missions. Some of our pilots never even got to drop a bomb or shoot the jet's GAU-12A 25 mm cannon. It all depended on luck as to whether you got that rare good mission or would be held on standby for three to four hours circling over Afghanistan. After my first ordnance release, it was another five months before my next "cleared hot" and drop.

'Some of my most memorable missions were on flights where we supported ground units without actually ever dropping any ordnance. Many included low altitude high-speed passes called "show of force" flybys. The feeling you get when a FAC thanked you for helping them out or saving them was one of the best I'd ever felt, especially when you previously heard the fear in his voice while they were engaged in a troops-in-contact situation and were about to be overrun. Having been an infantry platoon commander for four years before becoming a Harrier II pilot, I derived immense satisfaction from helping out my brother Marines and grunts on the ground.'

During VMA-513's 11-month detachment in Afghanistan, 13 pilots flew 1250 combat sorties for a total of 3763.6 flight hours. Throughout this period the unit had only six aircraft at its disposal. Nearly half of the total flight hours (1833.7) were performed at night, demonstrating the effectiveness of the AV-8B Night Attack jet when equipped with the Litening II pod. The detachment expended 12 GBU-16s, five GBU-12s, two 5-in Zuni rockets and 1922 cannon rounds. During the deployment pilots averaged 112 sorties and 340 flying hours apiece. Each jet flew an average of 58.8 hours per month, and the overall mission capable rate was 83 percent. As a result of this combat and other deployments in 2002-03, VMA-513 deservedly won the US Marine Corps light attack squadron of the year award in 2003.

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OEF 2004-06

With the fighting having seemingly tailed off in Afghanistan during 2003, VMA-513 was not replaced when it departed Bagram for MCAS Yuma in September 2003. Indeed, seven months would pass before a Harrier II detachment from VMA-542, assigned to the 22nd MEU-SOC's HMM-266 embarked in *Wasp*, deployed to Kandahar International Airport. The commander of the 22nd MEU-SOC, Col Kenneth F McKenzie, spoke positively to the media about the contribution made by the Harrier II detachment during his unit's commitment to OEF. 'Their speed, lethality and intelligence gathering capabilities have made them invaluable to our operations here'. The 22nd MEU-SOC also deployed helicopters from HMM-266 and personnel and equipment from BLT 1st Battalion, 6th Marines and MEU Service Support Squadron 22 into Uruzgan Province, in south-central Afghanistan. The US Marine Corps force operated alongside elements of the US Army's 25th Infantry Division, conducting military and civil support operations.

Lt Col Sean Blochberger, Officer-in-Charge of the VMA-542 detachment, added;

'We took nine pilots to Afghanistan with the 22nd MEU-SOC, and six of them had previous combat flying experience. I had sailed on a Harrier II MEU-SOC deployment to the Western Pacific and the Persian Gulf with VMA-211 as part of HMM-268 embarked in USS *Tarawa* (LHA-1) in 1998. During this deployment we had flown sorties over Iraq in support of OSW. In 2003 I made a combat deployment with VMA-542 aboard *Bataan* to Iraq in support of OIF I.'

Having completed a number of shipboard detachments, Lt Col Blochberger was well placed to describe life on board a Landing Helicopter Dock ship such as *Bataan* or *Wasp*;

'Every facet of shipboard aviation operations is more difficult (and usually more dangerous) than land-based operations. The mere fact of being at sea, away from a daily parts supply run, makes it a challenge to continuously replace failed parts with new ones in order to keep aircraft flying. The ship carries a certain number of parts, but it cannot stock as many items as you would like. Also, no one can anticipate the failure of parts that do not happen to be carried on the ship or aren't stocked in the quantities that you need them. The US Navy and the US Marine Corps do a great job in trying to anticipate parts needs. However, I have spent

AV-8B BuNo 164551 sits chained to the flightdeck of *Wasp* as it sails south through the Suez Canal in March 2004, heading for the forward operating area off Pakistan. This jet was one of four Harrier II+ aircraft (along with two Night Attack variants) assigned to VMA-542 'Det A', which was in turn part of HMM-266 within the 22nd MEU-SOC (*S Blochberger*)

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AV-8B Harrier IIs from VMA-542 'Det A' taxi into position for takeoff from *Wasp* on 11 April 2004 while the vessel sails in the Indian Ocean. Once aloft, these aircraft would fly north through Pakistan to Kandahar International Airport, which would be the unit's home for the next three-and-a-half months whilst it supported OEF (*US Navy*)

days on a ship waiting on parts that I needed in order to make an aircraft airworthy again.

'Once the parts problem is solved, the aircraft have to be put in a place where you can work on them – typically the hangar deck, where space is always at a premium. Once the aircraft is fixed, it has to be sequenced to go back up to the flightdeck for testing. After a functional test (only allowed during certain times), the aircraft may need to be flown. This requires moving the other aircraft out of the way so the jet can take off. If the aircraft does not pass its air test, the whole process (with all of the associated movement and delay) has to start all over again. Despite the best attempts of dedicated sailors and Marines to keep the jets flying, everything aboard a ship involving maintenance is slower, more difficult and more dangerous.'

The main terminal and tower at Kandahar International Airport. 'Operating six Harrier IIs safely and effectively out of Kandahar certainly proved to be a challenge', Lt Col Blochberger recalled. 'The runway was terrible – it was so bumpy that during takeoffs it would cause the pilots' HUD to vibrate violently enough to make it blurry. On numerous occasions the jet exhaust from our aircraft blew big chunks out of the runway during takeoff runs' (*S Blochberger*)

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VMA-542 'Det A' commander Lt Col Sean Blochberger poses with his six Harrier IIs shortly after their arrival at Kandahar on 11 April 2004 (*S Blochberger*)

Prior to VMA-542's 2004 deployment, Lt Col Blochberger accompanied the 22nd MEU-SOC command element and the HMM-266 leadership to Afghanistan to look at possible basing sites;

'We knew what to expect in-theatre, having looked over possible basing sites at Bagram and Kandahar. It was decided that the latter spot would be the best location from which to support the MEU. By going to Kandahar we would also be based with the other MEU aviation assets, our organic aviation support and the MEU command element. In-theatre, we also had access to USAF and Coalition tankers, as well as Marine KC-130s, in order to keep us on-station longer. This gave us a lot of loiter time to support ground forces when needed, allowing us to plan on conducting regular operations with a five-hour flight window.

'Once in Afghanistan, operating six Harrier IIs safely and effectively out of Kandahar International Airport certainly proved to be a challenge. The runway at Kandahar was terrible – it was so bumpy that during takeoffs it would cause the pilots' HUD to vibrate violently enough to make it blurry. On numerous occasions the jet exhaust from our aircraft blew big chunks out of the runway during takeoff runs. Because of the runway's deteriorated state, I wanted to limit the number of takeoffs and landings so as to preserve the runway and to minimise the possibility of engine damage from FOD.

'By taking off and staying airborne for five hours, our aircraft were able to cover a window that would normally be serviced by several sorties (and associated takeoffs and landings). By making use of aerial refuelling, we also lowered FOD risk and saved engines from damage. During the time we were there, we only experienced one serious engine FOD – we never determined if the FOD had occurred on the boat prior to going ashore or at Kandahar itself. Later, we had another engine FOD incident when we found nicks on some of the engine fan blades. If we had been at Yuma or Cherry Point, we would have called in the contractor blend team who would have smoothed out the damaged blades using specialist equipment, all while the engine remained in place in the jet. Unfortunately for our det, the contractor blend team could not come out to the combat zone to repair the blades, so we were forced to pull the engine, which is a major effort, in order to replace the nicked blades.

'We departed *Wasp* on 11 April 2004, flying north over Pakistan to Kandahar. The bulk of our support equipment was already at the airport by the time we arrived as *Wasp* had stopped in Qatar during the voyage over and offloaded it for onward airlifting by C-17 to Kandahar.

'Our plan was to fly two jets in the morning for five hours and two later in the day, also for five hours, within a few days *(text continues on page 42)*

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1
AV-8B BuNo 164142 of VMA-311 Detachment B, 15th MEU-SOC/HMM-163, USS *Peleliu* (LHA-5), Arabian Sea, November 2001

2
AV-8B BuNo 164566 of VMA-311 Detachment A, 15th MEU-SOC/HMM-163, USS *Peleliu* (LHA-5), Arabian Sea, November 2001

3
AV-8B BuNo 165385 of VMA-223 Detachment A, 26th MEU-SOC/HMM-365, USS *Bataan* (LHD-5), Arabian Sea, December 2001

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4
AV-8B BuNo 163876 of VMA-223 Detachment A, 26th MEU-SOC/HMM-365, USS *Bataan* (LHD-5), Arabian Sea, January 2002

5
AV-8B BuNo 165397 of VMA-211 Detachment A, 13th MEU-SOC/HMM-165, USS *Bonhomme Richard* (LHD-6), Arabian Sea, March 2002

6
AV-8B BuNo 165311 of VMA-542 Detachment A, 22nd MEU-SOC/HMM-261, USS *Wasp* (LHD-1), Arabian Sea, July 2002

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7
AV-8B BuNo 163867 of VMA-513, Bagram, May 2003

8
AV-8B BuNo 164551 of VMA-542 Detachment A, 22nd MEU-SOC/HMM-266, USS *Wasp* (LHD-1), Arabian Sea and Kandahar, April to July 2004

9
AV-8B BuNo 165004 of VMA-542 Detachment A, 24th MEU-SOC/HMM-365 USS *Iwo Jima* (LHD-7), Arabian Sea, September 2006

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10
AV-8B BuNo 165357 of VMA-223 Detachment A, 22nd MEU-SOC/HMM-261, USS *Kearsarge* (LHD-3), Arabian Sea, October 2007

11
AV-8B BuNo 164119 of VMA-542 Detachment A, 24th MEU-SOC/HMM-365, Kandahar, February to October 2008

12
AV-8B BuNo 165421 of VMA-214, Kandahar, May to November 2009

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13
AV-8B BuNo 165389 of VMA-214, Kandahar, May to November 2009

14
AV-8B BuNo 164551 of VMA-231, Kandahar, November 2009 to May 2010

15
AV-8B BuNo 164552 of VMA-231, Kandahar, November 2009 to May 2010

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16
AV-8B BuNo 165574 of VMA-513, Kandahar, May to November 2011

17
AV-8B BuNo 165580 of VMA-513, Kandahar, June 2011

18
AV-8B BuNo 165307 of VMA-223, Kandahar, October 2011 to April 2012

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19
AV-8B Bu No 165386 of VMA-223, Kandahar, October 2011 to April 2012

20
AV-8B BuNo 165572 of VMA-211, Kandahar and Camp Bastion, April to October 2012

21
AV-8B BuNo 165588 of VMA-211, Kandahar and Camp Bastion, April to September 2012

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22
AV-8B BuNo 165383 of VMA-231, Camp Bastion, September 2012 to April 2013

23
AV-8B BuNo 165390 of VMA-231, Camp Bastion, September 2012 to April 2013

24
AV-8B BuNo 165425 of VMA-311, Camp Bastion, April to September 2013

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of our arrival in Afghanistan. However, we soon encountered some problems that took us a while to overcome – these prevented us from commencing operations until the end of April. We had to set up many support facilities, such as an oil test lab, which took time and had an adverse affect on our operability. The Harrier II engine needs an oil sample to be taken and analysed every 15 flight hours, and it also requires a high-power test every 60 flight hours. With our missions usually lasting five hours, we needed to be oil testing every fourth day and conducting high-power inspections after 12 days of flying.

'The Harrier II needed a different oil analysis lab than the one that our helicopter squadronmates used, the only compatible one in-theatre having been established at Bagram by the EA-6B unit based there. Until we could get our own lab there was a time when we had to physically transport (on a logistics flight) our oil samples up to Bagram for analysis. As noted earlier, we were flying so much that the aircraft needed new oil samples taken every four days. This became a real readiness consideration for the detachment, as we were struggling to fulfil the requirements of the MEU's fire support plan.

'We solved the problem by using strip alerts. Until we got an oil lab onsite at Kandahar, we developed a scheme for testing aircraft after 15 flight hours. Instead of flying those aircraft on three five-hour sorties and ending up with grounded jets at the end of the third sortie, these machines would be reclassified as suitable for 30-minute strip alert duty only. That way, we could preserve the ability to fly five-hour patrols with serviceable jets, while at the same time being responsive if the MEU came into contact with the enemy by sending a time-expired aircraft directly to a target area if required. After a while we were able to create an oil sample lab in Kandahar, thus solving any serviceability issues.

'We finally got into the swing of things in May, when our six jets flew 440 hours. In June we were "full up" – no support or major maintenance issues – and we flew 508 hours. By comparison, a full 16-aeroplane Harrier II squadron in garrison at Yuma or Cherry Point may fly 350 hours per month.

'At Kandahar we had a runway, maintenance support, strategic tankers and an area of operations close to the base. From an operational standpoint, the combination of those factors made it an ideal place from which to provide effective support to the MEU. The only real challenges we faced were the condition of the runway and the ramp. Also, the base was situated some 3300 ft above sea level, and the temperature was pretty hot in the summer. This caused the takeoff roll for fully loaded jets (full fuel and combat ordnance loads) to be pretty long.

'Our Harrier II MEU detachment consisted of four radar jets and two Night Attack aircraft. The goal of our det was to have four out of six jets up and ready to fly at any one time. That is pretty much what we maintained most of the time at Kandahar. In the three-and-a-half months that we were in Afghanistan, we flew 1339 combat hours with six jets and about 80 Marines – this number includes both the squadron level and the intermediate level of maintenance support. The flight programme we performed was a Harrier II pilots' dream, as we all set personal records in terms of hours flown and dramatically increased our flight and combat experience levels. In Kandahar, pilots got more flight time in a week than

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AV-8B BuNo 165004 from VMA-542 'Det A' receives fuel from a USAF KC-10 during a patrol from Kandahar in the summer of 2004. Aside from carrying two 300-gal external tanks, this aircraft has a Litening II pod beneath its right wing and a single GBU-12 under the opposite wing. The fighter has also been equipped with gun pods. 'In-theatre, we had access to USAF and Coalition tankers, as well as Marine KC-130s, in order to keep us on-station longer', Lt Col Blochberger explained. 'This gave us a lot of loiter time to support ground forces when needed, allowing us to plan on conducting regular operations with a five-hour flight window' (*USAF*)

they got in a month back home.

'Afghanistan provided a great example of the differences between shipboard and land operations. Even though we were in expeditionary conditions in the middle of central Asia, parts supply and availability was better in Afghanistan than on the ship. Additionally, we could work on the aircraft 24 hours a day and perform aircraft functionals, high-power tests or check flights whenever we needed too. We did not have to manoeuvre in tight spaces, choreograph the movement of aircraft or schedule maintenance during set hours. As long as we had parts, which were flown in, we had the expertise to work as hard and as long as it took to keep the jets flying.

'We flew a lot of aerial reconnaissance missions, helicopter and convoy escort and CAS. The Lightening II pod was critical to our success – my detachment had four for six jets. The challenge facing US and Coalition forces in Afghanistan was countering insurgent activity. There was not much law in Afghanistan, so we were looking for violent groups making attacks. We started flying a lot of hours but, initially, did not see much in the way of ordnance delivery on the enemy. Sometimes we got calls to help troops-in-contact. Where we operated in Afghanistan, these troops could be Marines, Army, Special Forces or Coalition. Many times we would race over to where the action was, only to discover that the fighting had finished by the time we got there.

'Sometimes the troops on the ground would pass through a village and spot potentially dangerous activity going on, so they would ask us to perform a low-level show of force flyby. The enemy, who had yet to engage the soldiers, upon hearing the jet noise would know we were on-station and typically abandon their attack because they knew they would get pounded from above if they tried something. When we were in Afghanistan, the Taleban had a healthy respect for Allied air power. Many times, a low flyby or a show of force dispersed groups before they attacked friendly forces.

'The attitude of the Harrier II pilots was that whether or not we got to drop anything, if we could help the guys on the ground then we had done well. So, if we flew a low pass and made a lot of noise that dispersed the enemy, we might have saved a friendly life down there on the ground. Often, we did not get the satisfaction of dropping bombs but we helped the overall effort nevertheless. May 2004 was characterised by a lot of low flybys and not much (if any) ordnance dropped.

'We were supporting the MEU ground operations by scanning areas with our Litening II pods and escorting HMM-266 helicopters up to FOB Ripley, near Tarin Kowt, where the MEU Ground Combat Element was based. We also took tasking from the Combined Forces Air Component Commander [CFACC], which was subordinate to CJTF-76

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at Bagram. The latter organisation was in charge of US forces in Afghanistan at the time, so any excess Marine Air sorties that we had available were given to the CFACC. On any given day, we might fly sorties in support of our MEU and also missions from the CFACC. As a result, we could be tasked to go just about anywhere in Afghanistan when needed. Having said that, most of our sorties were flown in support of the MEU in Area of Operations [AO] "Linebacker", providing CAS for the 22nd MEU and its associated BLT.

'Aside from providing convoy escort, we would sweep ahead of the vehicles to see if the enemy was planning to ambush them. Although the Litening II pod was a great tool when performing armed reconnaissance and escort, it had its limitations. There was only so much ground detail that you could pick up with a targeting pod from the altitudes at which we typically flew – we tried to observe a hard deck of 10,000 ft, which was only crossed when performing a show of force flyby or strafing a target.

'In early June the fighting started to intensify, and we finally got to drop ordnance to help troops-in-contact. This was great, but it did not last long for the action then tailed off again.

'The flying we did in OEF was not like our experience in OIF. During the invasion of Iraq, when we were operating in kill boxes, we were allowed to attack any military target that we could positively identify within the kill box. We mostly dropped LGBs in an armed reconnaissance role during OIF. In Afghanistan CAS dominated our mission requests, with a FAC or a JTAC talking you onto a target. There were no markers (white phosphorus, high explosives or laser designators) to mark the target. This made it extremely challenging to ID the target that the FAC wanted you to engage. Our time in Afghanistan doing talk-on CAS made us think about just how frustrating CAS must have been during previous wars.

'The contrast between operating in Iraq and Afghanistan was striking. Within less than a year, we went from delivering high-tech laser-guided munitions in Iraq to employing old-time forward-firing ordnance (rockets and guns) in Afghanistan. You would fly out to the operating area and the guys on the ground would really like you to use forward-firing ordnance. We carried 5-in rockets in underwing pods and 25 mm semi-armour piercing high explosive incendiary rounds for the pod-mounted GAU-12A cannon fitted beneath the fuselage of the jet. Although we did indeed drop bombs, we mostly used rockets and guns to suppress targets when our guys got ambushed by enemy forces hiding in the mountains. It was very challenging to sort out the targets due to the mountainous terrain and the lack of markers on the ground.

'Occasionally we would get a call to support troops-in-contact but, due to a low fuel state, we had to get a quick hit of gas from the tanker first. In addition to concentrating

Sandstorms were a frequent occurrence at Kandahar, with this particular one enveloping the airfield on 5 June 2004 (*S Blochberger*)

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on tanking, pilots would try and build their situational awareness of the fight (based on the radio calls) so that they would know where the good guys and the bad guys were prior to arriving on station. This would allow them to deliver ordnance quickly as soon as they were overhead the target.

'During a CAS mission you would spend a lot of time talking with the FAC on the ground to determine where he was. It often proved difficult to reconcile the difference between what he saw on the ground with what we, the pilots, were seeing at altitude when it came to describing the terrain. The FAC might say "I am on a road by a mountain". Meanwhile, the pilots in the jets were at 20,000 ft, from where they could see multiple roads and several mountain ranges! Sometimes, with troops-in-contact, you could see smoke where the action was occurring. You could then ask, "Where are the bad guys in relation to the burning HUMVEE?" Many other times it was not that clear, however. Often, we had to go against snipers in the rocks. Snipers are impossible to see from an altitude or a slant range that may be more than four nautical miles away. You need a highly skilled FAC to talk a pilot's eyes onto the target.

'A critical factor during a CAS mission was the building of situational awareness so that you could drop ordnance where it was needed. Time was ticking and no one wanted to fail to help the guy on the ground. We did not want to let him down. Ideally, when we went into a target area, we wanted to determine where the target was right away. However, as previously mentioned, this was usually never easy. We had to use all of the systems in the aircraft (sensors, map, etc.) along with a lot of verbal back-and-forth with the ground controller in order to figure out all of the dimensions of the problem – target location, friendly location and threat.

'Determining, with confidence, where to deliver ordnance was more difficult than the actual mechanics of dropping a weapon. FACs would not let you drop bombs or fire rockets or the gun unless they felt very comfortable that the pilots in the aircraft had the right target and knew the position of friendly forces. You had to have both aspects of the problem solved – the FAC had to have confidence that the aircrew had the correct target. The pilot had to establish a clear picture of the target location and the location of friendly forces. All the while, the clock was ticking – the guys on the ground were being attacked by the enemy and the jets on station continued to burn fuel at a rapid rate.

'On rare occasions this process was straightforward, and thus solved quickly and easily. Most times, this was not the case. It took skilled pilots and clever ground controllers to build enough situational awareness of the problem to result in ordnance on target, on time. This is what makes CAS a challenging mission, and the execution of talk-on CAS (with no target marker) the most difficult variation of this mission. Any error results in failure of various sorts – either no ordnance delivered, weapons delivered off target or ordnance dropped on the friendlies (the worst-case scenario).

'On one of the first occasions that the MEU got into heavy action requiring CAS from the Harrier IIs, some of my guys were called in to counter bad guys ambushing the Marines on a road. The pilots used 25 mm cannon fire to knock out the attackers. During an ambush such as this, both time and accuracy were critical. The pilots did an outstanding job in finding the target quickly, gaining the confidence of the FAC and then delivering the weapons at the right time in the right place.

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After hearing about the mission from the returning pilots, I also remember being very proud and impressed at how well they had performed.

'I recall one mission I flew with Maj Ed Villalobos, the detachment Weapons and Tactics Instructor and my No 2 officer. Although this was a combat sortie, it was also part of my annual NATOPS [Naval Air Training and Operating Procedures Standardization] check ride. Our aircraft were configured in our routine load out – the lead would have a Litening II pod, guns and an LGB, while the "Dash 2" aircraft would have a gun with 300 rounds, a 5-in rocket pod and an LGB. We took off and checked in with the Marine Direct Air Support Center [DASC], call sign "Chieftain". Expecting to have to wait for a mission, we were surprised that "Chieftain" immediately pushed us up to a FAC who stated that he had a target for us. The handover was really quick – the best-case scenario for CAS pilots.

'We went to the target, where the Marines were on a road and the bad guys were near the top of a hill. I strafed the target with about 100 rounds of 25 mm fire, and Ed got a correction off of my hits to move up the ridgeline, also with 25 mm gunfire. I recall flying three gun passes using semi armour-piercing high explosive incendiary [SAPHEI] rounds. Usually when you fire the gun, you cannot see the ordnance travel downrange. After you squeeze the trigger, you do not see anything until you observe the bullets impact the target. The impact of the bullets looks like little puffs of dust on the ground. It is actually pretty unimpressive. In the case of the SAPHEI rounds, they are all tracers, so you can see the rounds come out of your aircraft – they look like red dots – and travel all the way down to impact. I could see the hits, pull off the target and make a correction to my aim point, before running in again. Ed and I hosed down the ridgeline with gunfire, then it was over. We went to the tanker and got fuel.

'Being able to drop ordnance right away was pretty rare and quite a treat. I thought that we would spend the rest of the mission orbiting. To our surprise, we checked back in with the FAC after refuelling, and he told us that he had another target. This time we dropped LGBs. It was the best NATOPS check ride ever!

'On a typical mission, we would take off, check out with departure control and then check in with command-and-control at the Tactical Air Operations Center [TAOC] at Kandahar – initially run by the USAF and later taken over by the 22nd MEU – who managed the battle space. The TAOC would clear you to the DASC, which was also run by 22nd MEU Marines, but this time from FOB Ripley. Our operating areas were AO "Linebacker" and later AO "Flanker", which were designated as Marine air space. An AO was an operational area defined by the force commander for land, air and naval forces to conduct combat and non-combat activities in. The DASC would direct us to a frequency and give us the call sign of the FAC we were to talk to. We then headed off to the area that our contact was working.

'We would fly up to an altitude of 18,000 ft. If you wanted to go higher, you had to check in with the TAOC. However, there was no positive air control like in the US or Europe, so we didn't have to worry too much about violating airspace or conflicting with airliners. Once we got to the working area, we would talk with air officers and then a specific FAC. The A-10s from Bagram also followed the same procedures.

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'On the radio, you would hear different aircraft check in and head out on missions. Most of the time the TACAIR working targets while we were in-theatre were either A-10s flying out of Bagram or 22nd MEU Harrier IIs flying out of Kandahar. Sometimes we would hear of B-1s in the area too. Now and then, we would also hear some US Navy aircraft on the radio, although most of the carrier aircraft in-theatre were supporting OIF at that time. We also heard tankers and transport aircraft flying around. On any given mission, we could support Army, Marines, Special Forces or Coalition forces. We would go into a kill box as relief for a flight of A-10s who were coming off station. Often, we were in turn replaced by A-10s when our window ended.

'When supporting a MEU mission, we would talk with Marine FACs and then orbit around, circling in the sky, until we received their call. Typically, there were hours of boredom in the cockpit interrupted by periods of intense excitement. In OIF I, when we were not doing CAS, we could fly an armed reconnaissance mission that would inevitably see us blow stuff up without the help of a FAC. In Afghanistan, all of the ordnance we delivered was dropped under the direction of a ground controller. I think we had 30 troops-in-contact calls that resulted in show of force overflights and the expenditure of ordnance. In ten of these 30 situations we fired guns or rockets. So, in just 20 of the 400+ sorties we completed, we got to deliver bombs. For the rest of the time we had to be satisfied with low passes or routine patrolling.

'In Iraq, we dropped ordnance on a variety of military targets – tanks, buildings, troop concentrations, etc. – but in Afghanistan we primarily hit bad guys hiding in the rocks. The opportunities to excel were few. However, when you did get the chance to employ your weapons it was critical to perform well and get your ordnance on target where it could make a difference to the troops on the ground. It gave you a great feeling at the end of a bombing run when the FAC said "nice hits" over the radio.'

Capt Edward J Miller was one of the pilots assigned to VMA-542 at Kandahar in 2004;

'Afghanistan is a very desolate place. I had previously flown AV-8Bs from Kuwait and thought that was rough, but the terrain in Afghanistan

VMA-542 'Det A's' pilots and maintainers pose for an end-of-deployment photograph at Kandahar in late July 2004. The detachment performed more than 400 strike and ISR sorties totalling 1339 combat hours during its time in-country (*S Blochberger*)

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is far more rugged. There is a desert and then north of Kandahar the mountains start to get bigger until they reach their peak around Bagram. Within 20 miles of Kandahar there are 10,000 ft mountain ranges.

'We were sent to Kandahar, rather than Bagram, because the AOR [Area of Responsibility – the geographical area associated with a combatant command within which a combatant commander has authority to plan and conduct operations] our Marines were to be in charge of was closer to Kandahar. VMA-513 had, of course, operated its AV-8Bs from Bagram in 2002-03. However, we were a 22nd MEU asset, rather than being assigned to CJTF-76 [VMA-513 had been controlled by CJTF-180, CJTF-76's predecessor, when in-theatre], and we were there to provide air support for Marines and other Coalition forces. Seventy-five percent of our missions were eventually flown in support of Marines and the remaining 25 percent went through the CFACC.

'Throughout our time in Afghanistan we principally shared the TACAIR CAS role with the 16 A-10s at Bagram. We were given the south central and western areas of Afghanistan to cover while the A-10s patrolled the eastern border with Pakistan and the north. Sometimes the A-10s flew south, but they were slower than us so it took them a while to get down to our AOR. Admittedly, the A-10 could stay on station longer than the AV-8B, but it did not get to the fight as fast.

'Mostly, we flew five hours missions, and some stretched to as long as seven hours as the Marines really liked us to be around at dawn and dusk when the Taleban mounted most of their attacks. We usually had aerial tankers available – very rarely did we not have them. We were there for almost four months, and in that time we completed 1300 flight hours with six jets. I flew 160 hours in four months, including 60 hours in just a month. We flew a lot, and the jets held up well. Working with tankers helped, as you could keep flying rather than having to land to refuel and then take off once again – shutting engines down and restarting them puts extra stress on powerplants.

'As previously noted by Lt Col Blochberger, the 10,000 ft runway at Kandahar was in poor shape. Some 3000 ft of one end was unusable to us and there were patches all along where we had bombed it during the initial attacks in 2001. We were very careful about FOD. A pilot not scheduled to fly would take a John Deere M-Gator utility vehicle and run up and down the runway looking for debris before each takeoff and landing. Such precautions were necessary to ensure safe engine operations.

'We had received a few briefs from VMA-513 about their earlier operations at Bagram – which was situated 3300 ft above sea level – that covered things like high altitude flying in hot conditions, dust storms, support issues and FOD. We used the lessons learned from VMA-513's deployment to make sure that we took the right things to Kandahar. Only the AV-8B and the A-10 could operate from Kandahar and Bagram at this time due to the poor condition of the runways, taxiways and ramps. The Harrier II gave us the ability to operate in a reduced runway environment.

'Once in the air, we checked in with the DASC and talked with a FAC, be it a Marine, Army or USAF controller. If it was a Marine we would provide on call CAS to support ground operations by the 22nd MEU. Although we occasionally performed armed reconnaissance or helicopter escort, 75 percent of the missions flown were CAS. We came to know the

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AV-8B Night Attack jet BuNo 164140 is flown back aboard *Wasp* by Capt Joseph Beals at the end of VMA-542 'Det A's' Kandahar deployment. LHD-1 would return to Naval Station Norfolk in September 2004, thus bringing to an end its seven-month combat cruise (US Navy)

three FACs assigned to the Marine battalion very well, and we got to where we were very confident that we could always help each other out.

'A lot of the missions we flew used tactics we had learned in OIF I known as "keyhole CAS", which used a new target reference system for command-and-control. With forces moving quickly, we found that "keyhole CAS" helped pilots and FACs work well together. We would get a nine-line brief but in a different format, receiving all the target coordinates, elevation and restrictions, as well as other data.

'The first time I saw action in Afghanistan, a Marine patrol was getting shot at and a FAC asked us to perform a show of force flyby. I was focused on doing the job right to help Marines in combat, and we kept looking around because we weren't sure if they were shooting at us too.

'The first time I dropped ordnance on target it was the culmination of all the things I had learned in training prior to this mission. By the end of the deployment in-theatre I had expended ordnance on five occasions for troops-in-contact. I used the gun, fired Zuni rockets – which was pretty exciting – and also dropped LGBs.

'The AH-1W Cobra crews could see the bad guys they were engaging, but we could not. Most of the time the bad guys fired from the hills, using the terrain for cover. When employing the gun, we had to be careful not to get too close to the ground because of the steep terrain from which they were firing. When strafing, we observed a hard deck of 6000 ft, which was a little over a mile from the ground. From that distance it was hard to see a human figure among the rocks. The FAC would usually give us grid coordinates for the target area, and sometimes they used an IR [infrared] marker or fired mortar rounds onto the target for us to see. Mostly, however, the FAC would talk us onto the target.

'Although we got little feedback on the results of our CAS other than the occasional "good hits" on the radio from the FAC, I got talking to a Marine driver at Kandahar one day when he was driving me somewhere on base in a pickup. He asked me what my job was and I told him I was a Harrier II pilot. He immediately thanked me for saving him and his buddies when their convoy got ambushed. A jet had strafed and rocketed their attackers, getting them out of a jam. This brief conversation proved to me that VMA-542 was having an impact on OEF and saving the lives

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Flightdeck directors assigned to the V-1 Division chain down a recently landed AV-8B Harrier II aboard *Iwo Jima* while a second jet closes on LHD-7's stern on the eve of VMA-542 'Det A's' deployment to Kandahar (*US Navy*)

of US and Coalition troops. It also validated the idea of Marines providing CAS for Marines in combat.'

In late July 2004 VMA-542 departed Kandahar and returned to *Wasp* with the rest of HMM-266 and the 22nd MEU-SOC. From late September 2004 the Royal Air Force assumed responsibility for the rotation of Harrier GR 7 units to Kandahar. USAF A-10s, B-1Bs and F-15Es, carrier-based US Navy F/A-18s, French Mirage 2000s and Dutch, Danish and Norwegian F-16s, operating from Kyrgyzstan and, later, Afghanistan, also provided air support for Coalition forces.

A significant spike in Taleban attacks in 2005-06 led to the call for more troops and air power to be sent to ISAF in Afghanistan, resulting in US Marine Corps Harrier IIs returning to OEF after a gap of more than two years.

During the second half of 2006 USS *Iwo Jima* (LHD-7) and its ESG supported the deployment of the 24th MEU-SOC from Camp Lejeune,

AV-8B Harrier II+ BuNo 165004 from VMA-542 'Det A' assigned to HMM-365/24th MEU-SOC accelerates along the flightdeck of *Iwo Jima* on 21 September 2006. That month the unit flew regular operations against targets in Afghanistan, often landing at Kandahar to refuel and rearm mid-mission (*US Navy*)

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Two jets from VMA-542 'Det A' of the 24th MEU-SOC sit on the ramp at Kandahar on 15 September 2006. The LGB-12s seen in the foreground were destined for fitment to these aircraft. A detachment of 20 personnel from HMM-365 was forward-deployed to Kandahar between 9 and 21 September to refuel and rearm Harrier IIs patrolling in-theatre from LHD-7. A Canadian Forces C-130H is on short finals to Kandahar's single runway behind the Harrier IIs (*US Marine Corps*)

North Carolina. This unit included a command element, a BLT (1st Battalion, 8th Marine Regiment), associated air support under the control of HMM-365 and Combat Logistics Battalion Group 24.

When LHD-7 reached the Arabian Sea in early September 2006, its MEU went ashore to exercise with Pakistani forces. The AV-8B detachment, however, had convinced the MEU that it would be better employed supporting ISAF troops in southern Afghanistan. VMA-542 'Det A' duly started operating four AV-8Bs out of Kandahar from 9 September thanks to the deployment of a small team of maintenance personnel and ordnance specialists from HMM-365 to the air base. Jets were refuelled and rearmed at Kandahar after they had flown their first mission from LHD-7 – following a 1.5-hour flight from carrier, the Harrier IIs could only initially provide 20 minutes of CAS before they had to land at Kandahar. Sent out on a 2.5-hour patrol again after an hour on the ground, the aircraft would return to Kandahar for a second time to refuel and rearm, then complete a third 20-minute mission before heading back to the ship and landing on at midnight. This unusual flight programme had to be adopted by VMA-542 because *Iwo Jima's* 12-hour flying window was driven by the MEU exercise in Pakistan, rather than the combat missions being flown by the Harrier II detachment.

Primarily flying CAS, and participating in Operation *Mountain Fury* (a NATO-led offensive aimed at clearing the Taleban from the eastern provinces of Afghanistan), AV-8B pilots completed 136 combat missions over Afghanistan during the 12-day deployment, delivering 17 PGMs and making four strafing runs.

Lt Col Robert Barr, CO of HMM-365 remarked in a US Marine Corps media release;

'By using Kandahar air base, we doubled the number of sorties we could generate. The versatility of the Harrier II allowed us to rapidly refuel and rearm and then get back into the fight. Our jets truly made a difference during this period of operations.'

The AV-8B detachment, assigned to the 24th MEU-SOC, was led by Maj Pete Lee, who recalled;

'We left Norfolk on 6 June and sailed across the Atlantic, enjoying port calls in Marseille and Civitavecchia upon entering the Mediterranean. On the evening of 2 July, just north of Crete, we lost a jet off the back of the boat when the pilot had insufficient power to hover alongside the ship in preparation for landing. He was recovered with only minimal injuries eight minutes after ejecting. Marine Air Group [MAG] 14 quickly sent us two replacement Harrier IIs, so we had seven jets – a mix of Night Attack and radar aircraft – and we really needed them.

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'We sent out two four-jet sections a day, the detachment enjoying great support from *Iwo Jima* while we flew combat missions into Afghanistan and the MEU exercised in Pakistan. We would fly all the way into Afghanistan from the boat, do CAS and then land at Kandahar. At that time the base was a mess, with the runway under reconstruction and ramp space at a premium. We wanted to det there on a more permanent basis, but there was simply no room for us.

'The best we could do was station a few Marines there, land, get bombs and refuel after completing a mission straight from the boat, then fly another mission and return to Kandahar for more fuel, before heading back to the ship. It was a 90-minute flight to *Iwo Jima*. We put a lot of flight time on the jets, so it was great that we had that seventh aircraft.

'We did not have assigned tankers, as they supported USAF strike aircraft flying from Qatar and US Navy jets off the carriers. Now and then we could sneak in and get fuel, but most of the time we had to land at Kandahar for gas and bombs. Without tanker support, we had to fly all of our missions with two drop tanks. We also carried a Litening II pod and a GBU-12, with the lighter Night Attack jets being fitted with gun pods as well – we used the gun a bit in Afghanistan in 2006.

'Our principal weapons of choice were the GBU-38 JDAM [VMA-542 became the first Harrier II unit to drop a GBU-38 JDAM in combat from a LHD class warship] and the GBU-12 LGB. One jet would carry the JDAM and the other an LGB, since the latter weapon could hit moving targets – the JDAM was a precision weapon for stationary targets. With the JDAM [which could be used in any weather conditions, unlike the fair weather LGB] you could adjust the impact angle. It also had a greater standoff capability than the LGB. I did not have a preference for either weapon, just as long as we had one on each jet.

'We would launch a pair of aircraft in the morning, followed a short while later by a second section of two AV-8Bs. All four jets would undertake CAS missions over Afghanistan during the course of the day, using Kandahar as a base, before heading back to the boat at night. Most of the time we flew in daylight hours, but sometimes our missions extended well into the night.

'During this period of the conflict there were no Marines in-theatre to support, so we undertook CAS for the NATO troops within ISAF. I flew for the Italians, the Canadians in Kandahar Province, the Dutch and the British, as well as for US Special Forces with USAF terminal controllers. The accents and the cultures were different and the groups had various levels of support requirement. In 2006 we flew all over the place in support of Coalition forces. We were routed around the country based on whoever needed air support, and we supplied both ISR and on call CAS.'

VMA-542 Detachment A ended its commitment to OEF on 21 September when the small team of maintainers and armourers from HMM-365 returned to LHD-7. The following month, while *Iwo Jima* was sailing in the NAG, the detachment was briefly committed to OIF when it flew 42 sorties over Basra, in southern Iraq, from LHD-7 in support of British forces taking part in Operation *Sinbad* – a campaign led by Iraqi security forces to root out the corruption that plagued the police force in southern Iraq. *Iwo Jima* eventually returned to its homeport of Naval Station Norfolk in early December.

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OEF 2007-10

By 2007 NATO's ISAF was composed of military forces from the US, UK, Canada, The Netherlands, Australia, Germany, Italy, France, Spain and a handful of other nations, these troops participating in both peacekeeping and the training of the ANA and the Afghan police force. Despite the significant NATO presence in-theatre, a resurgent Taleban continued to expand its offensive across Afghanistan to the point where additional US and international ground forces and air power had to be sent to Afghanistan to protect ISAF.

Amongst the TACAIR assets committed to OEF in an effort to blunt the Taleban offensive was the VMA-223 detachment assigned to HMM-261 as part of the 22nd MEU-SOC embarked in USS *Kearsarge* (LHD-3). Having already flown OIF sorties for a number of weeks in September 2007, VMA-223 shifted theatres to OEF the following month when LHD-3 departed the NAG and headed east into the Arabian Sea. The det commander was Maj John K Adams;

'We had initially seen combat while flying missions in support of OIF off *Kearsarge* while the MEU was ashore in Kuwait training. For three or four weeks during this period we flew regular strike missions into Iraq. We then received word that there was an urgent requirement for fixed wing support in OEF, so our ship sailed to the coast of Pakistan and we flew missions for our own MSOC [Marines Special Operations Command] in southern Afghanistan. These missions went very well as we had already trained with these guys. We only provided coverage for about a week, but I think weapons were dropped on almost every single sortie.

'Our Marines were operating in southern Afghanistan, just north of Camp Leatherneck. We would launch two-ship sections on mostly day missions, although there were some night sorties too. We took off and flew across Pakistan, hitting a tanker en route – usually a USAF KC-135 or KC-10, but sometimes a Brit Tristar. We also flew with RAF Harriers on occasions. The night missions were unplanned, usually being an extension of a day mission. Our missions were in direct support of Marines, but we also helped Coalition forces as well. At this time our typical load-out was two fuel tanks, a Litening II pod, either a GBU-38 JDAM or GBU-12 LGB and the gun pods. *Kearsarge* provided us with excellent support and always remained flexible in terms of its active flightdeck hours.'

As combat intensified in Afghanistan, the US Marine Corps commenced testing new systems in-theatre that were aimed at

Two AV-8Bs from VMA-223 'Det A' land back aboard *Kearsarge* during a composite unit training exercise in the Atlantic Ocean on 22 May 2007. The detachment of six Harrier IIs from VMA-223 was assigned to HMM-261/22nd MEU-SOC whilst embarked in LHD-3 for the six-month combat cruise that commenced on 30 July 2007 (*US Navy*)

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An AV-8B Harrier II+ from VMA-223 'Det A' sits chained to the stern of USS *Kearsarge* (LHD-3) while the guided missile cruiser USS *Vicksburg* (CG-69) holds station behind the vessel on 20 June 2007. The *Kearsarge* ESG was just weeks away from commencing a six-month deployment when this photograph was taken. VMA-223 'Det A' would fly combat missions over Iraq and then Afghanistan from LHD-3 in September-October 2007 (*US Navy*)

improving both command-and-control and communication links between troops on the ground and supporting TACAIR assets. 'We determined that a digital fire support capability was needed', explained Maj Brian J Newbold, Team Fires Lead, US Marine Corps Systems Command. According to Capt Ryan B Ward, an AV-8B Weapons and Tactics Instructor also assigned to US Marine Corps Systems Command, 'In the past a FAC used binoculars, compasses and maps to split out a target, and then send the coordinates via radio. Up until very recently that method had not really changed since the Vietnam War. Now we use digital binoculars to give the distance and range of the target and transmit this information through Strike Link directly to aircraft or artillery batteries. Strike Link reduces both human error and the time it takes to pass target coordinates'. The US Marine Corps started testing Strike Link in Afghanistan on 12 April 2008.

The previous month the Air Combat Element of the 24th MEU-SOC's HMM-365 had arrived in-theatre to provide air support for two US Marine Corps battalions and other US forces and Coalition units fighting in Afghanistan. Deploying directly from CONUS to OEF to temporarily fill a standing ISAF request for a manoeuvre force in southern Afghanistan, rather than embarking in USS *Nassau* (LHA-4) and sailing to the Arabian Sea as had originally been planned, HMM-365 (including six AV-8B Harrier IIs from VMA-542) flew round-the-clock missions from Kandahar for six months. Much of their focus was on the Garmsir District of Helmand Province, which was the 24th MEU's AOR.

VMA-542 played a key role in Operation *Azada Wosa* (a major counterinsurgency offensive to liberate the Taleban-held town of Garmsir) from late April. As usual, the unit relied heavily on the Litening II pod when providing CAS, as AV-8B Requirements Officer Lt Col Peter Blake recalled in an article published in the Winter '09 issue of *The Yellow Sheet* magazine;

'In May Maj Ryan Ward and his wingman, Capt Art Bruggerman, observed Taleban fighters burying Improvised Explosive Devices (IEDs) near Marines from BLT 1/6. The FAC with the Marines could only communicate verbally by radio with his command element, but with Litening II pods on station with the Harrier IIs, the commander was able

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A CH-46E Sea Knight nears the amphibious assault ship *Kearsarge* while returning from a relief mission in Pahoraghata, Bangladesh, on 1 December 2007. LHD-3 was sent east from the Arabian Sea so that the rotary elements of HMM-261 could conduct humanitarian assistance and disaster relief efforts in response to the Government of Bangladesh's request for help after Tropical Cyclone Sidr struck the country's southern coast on 15 November. Three of VMA-223 'Det A's' six jets can be seen parked on the stern of the carrier (*US Navy*)

to see a live video feed of the Taleban insurgents setting up an IED. With that visual verification, he in turn relayed the target confirmation to the MEU commander, who was then able to receive approval from the ISAF headquarters to strike the insurgents – approval that certainly would not have been granted without verification provided by the Litening II pod's video downlink. After ISAF approval, the Harrier IIs were cleared by the FAC to drop two 500-lb JDAM on the enemy, killing six Taleban who had been intent on killing BLT Marines.

'In a related mission with the same Marines, the Litening II feed again facilitated approval to strike another Taleban target, this time taking out the regional IED coordinator and his weapons cache. Without the live video that the pod provided, neither of these missions would have been approved. In both cases, the Litening II pod helped Marines find the enemy, provided real time situational awareness for commanders to positively identify the targets and guided precision weapons to their targets.'

Capt James Tanis, who was assigned to VMA-542 during this deployment, detailed several missions that he flew from Kandahar in support of *Azada Wosa*;

'We were in the middle of providing CAS for the MEU over Garmsir when we were called away to support British troops coming under fire. Within 15 minutes of being re-tasked, we were flying overhead the Brits. Having helped them out, we then returned to Garmsir and continued with our original CAS commitment to the Marines. It was interesting flying a mission within a mission!

'Our most intense day was 15 June when we supported five sets of troops-in-contact. For one of them, not only could we hear machine guns at the FAC's position returning fire, we also could hear them taking fire too – I heard rounds impacting the ground near the FAC as he talked with us.

'We heard some interesting accents on the ground while flying in support of ISAF. Sometimes we got the information we needed, and we also received great feedback on the impact of our support with shouts of "bloody hell mate, direct hit!" over the radio. Sometimes, when operating with less experienced FACs, we tried to get them the support they needed as quickly as possible, while at the same time trying to calm them down and draw the information we needed from them.

'All forces in Afghanistan used some form of a standard FAC brief when requesting air support. Even during intense fighting, pilots were required to repeat back to the FAC critical information such as the location of the target and its distance from friendly forces. Working with our own guys was nice because we knew them, and they knew us and our procedures. When you were working with say a Dutch JTAC or a Brit, some of them were extremely professional and they would talk with you accordingly, "big to small" to confirm what target they needed hit. With others, you

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just needed to take that extra minute to confirm how close the enemy was to friendly forces and where the latter were in relation to the fire they were taking. The most rewarding thing was knowing you were going to support guys who were taking fire, and you were hopefully going to take out the enemy for them.

'Most of the requests we received saw us flying in over-watch mode. The troops on the ground were moving from "A" to "B", or they were carrying out a patrol. We looked for suspicious activity, IEDs and potential ambush spots. For much of our time in-theatre we flew every morning in support of ISAF troops, talking with Dutch, Italian, US Army and Brit forces all in the one flight. We even had Australians controlling us when we return to Kandahar!'

VMA-542 returned home with the rest of HMM-365 in October 2008 when the 24th MEU-SOC handed over control of the Garmsir District to British forces.

With the US Marine Corps presence in theatre increasing in size after President Barack Obama approved a 30,000-strong troop surge for US forces committed to OEF in response to increasingly violent attacks by the Taleban, Marine Aircraft Group (MAG) 40 was reactivated at MCAS Cherry Point and deployed to Afghanistan in the spring of 2009 to control helicopter and fixed-wing units in-theatre. Having its HQ at Camp Leatherneck (the US Marine Corps base carved out of the desert adjacent to the airfield at British-controlled Camp Bastion, in Helmand Province), MAG-40 served as the Aviation Combat Element for the 2nd Marine Expeditionary Brigade-Afghanistan (MEB-A). It duly supported OEF from the spring of 2009 through to April 2010, when MAG-40 was relieved by the 3rd Marine Aircraft Wing (MAW).

For much of its time in OEF, MAG-40 was composed of two CH-53 squadrons, one light attack helicopter squadron, one AV-8B Harrier II squadron, one MV-22 Osprey squadron, one KC-130 tactical aerial refuelling squadron, one unmanned aerial system (UAS) squadron and an aviation logistics squadron. MAG-40 was led by Col Kevin Vest, a former CH-53 pilot who had switched to the Harrier II. Col Ben Hancock worked closely with MAG-40 in 2009 during his time as the senior Marine adviser for US Marine Corps Forces, Central Command (MARCENT). The latter was the US Marine Corps service component commander for Commander, US Central Command (COMUSCENTCOM), which was the unified command responsible for US security interests in 27 nations from the Horn of Africa, through the Arabian Gulf region into Central Asia. CENTCOM is one of nine unified commands in the US Department of Defense. Col Hancock explained;

'I was the senior Marine adviser for MARCENT to CENTCOM's Forces Air Component Commander at Al Udeid air base in Qatar. MARCENT supported Marine operations in Iraq and

An underside view of a VMA-214 AV-8B Night Attack jet armed with a GBU-12 LGB and GAU-12 25 mm cannon, and carrying a Litening II pod and two 300-gallon external fuel tanks. The unit deployed ten Harrier IIs to Kandahar in May 2009, six of them Night Attack jets (*E Schaefer*)

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One of four AV-8B+s flown by VMA-214 from Kandahar, BuNo 165421 was marked up as the unit's 'colour' jet (including bearing the name of the unit's first CO, Maj 'Pappy' Boyington, beneath the cockpit). A veteran of OIF with VMA-214, the aircraft wore this distinctive scheme throughout its time in-theatre (*E Schaefer*)

Afghanistan. In OEF, I was in support of the 2nd MEB-A, commanded by Brig Gen Larry Nicholson.

'Marines prefer Marine jets or attack helicopters overhead in a firefight, even though the USAF and our NATO allies had some great aircraft and capability in-theatre as well. The main difference between the Marines and other CAS pilots is that most of the time Marine pilots fly in support of units that they have a close relationship with. The vast majority of the Marine JTACs are pilots, and many of the pilots in-theatre have worked with some of the ground officers at company, battalion and regimental levels. Because Marine CAS aircraft flew over the Marines in Helmand every single day in 2009, they soon achieved voice recognition with their JTACs.

'Brig Gen Nicholson, commanding general of 2nd MEB-A [Task Force Leatherneck], made it clear from the start that Marines were to engage the enemy and suppress or kill them with organic weapons first at platoon, company or battalion levels. They were ordered to take care of a situation on their own using 5.56 mm, 7.62 mm or 40 mm gunfire, or mortars. If required, the infantry could then call for artillery support and, lastly, CAS. Artillery included 155 mm M198 howitzers and the M142 High Mobility Artillery Rocket System. Last call would be for CAS from Cobras, Hueys and TACAIR. Our guys were very reluctant to declare "troops-in-contact".'

From 14 May to 14 November 2009 ten AV-8Bs from VMA-214 provided MAG-40 with its TACAIR capability from Kandahar. Six months prior to deploying from MCAS Yuma, the unit had been expecting to send a six-jet detachment to sea for eight months from January 2009 with the 31st MEU-SOC as part of HMM-262 embarked in USS *Essex* (LHD-2). However, this requirement was filled by VMA-211 when OIF commitments came to an end in 2008. Nevertheless, as scheduled, VMA-214 still embarked six aircraft aboard USS *Boxer* (LHD-4) with HMM-163 as part of the 13th MEU-SOC in January 2009.

'In October 2008 we received indications that we would be deploying to Afghanistan, rather than simultaneously undertaking two MEU cruises', Lt Col Eric Schaefer, CO of VMA-214, recalled. 'We were made the lead squadron for this tasking by MAG-13 at Yuma. Although the exact nature of the fixed wing requirement for Afghanistan had not been identified at that stage, the need for fixed wing aircraft to support the soon to be deployed MEB-A had. We started working our mission analysis with the CO of MAG-40, Col Vest, in preparation for the deployment. Simultaneously, the squadron was also in the final stages of readying the detachment to support the 13th MEU – this deployment took half of the squadron's aircraft [six jets] and most of my experienced pilots and support team. With only a few months to prepare for the Afghan deployment, we had only one working AV-8B, one qualified instructor, a few senior officers and eight very junior pilots, plus some experienced NCOs.

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'We knew that the 2nd MEB(A) would be in-theatre with only limited fire support assets available, so aviation fires [TACAIR CAS] were a key element within Brig Gen Nicholson's plan for force protection for his troops. We had a requirement for 24/7 fire support, but we had less than a full squadron of aircraft to achieve this goal. Thus we had to identify efficiencies to meet our requirement. We did a lot of training to expand our maintenance qualifications so when a jet came back from a mission, all of our Marines could fix the problems and have it ready to fly in a short time. Another area we focused a lot of attention on was FOD. The AV-8B is very vulnerable to FOD damage as its engine sucks up everything. However, during 3000 combat hours in OEF we had only three FOD incidents. This was a function of trained Marines with a lot of motivation ready to do the work.'

VMA-214 deployed to Kandahar in May 2009, the unit sending six Night Attack and four radar aircraft to Afghanistan. Two of the Night Attack jets were the oldest examples in the fleet at the time. The squadron had been told that it would have ample time to prepare its working spaces at Kandahar, as it was not expected to commence operations until after 10 June. However, as enemy activity near the FOBs increased, VMA-214 was asked to commence flight operations earlier than expected. Aircraft were sent to overfly FOBs, observe enemy activity in those areas where the MEB-A would soon be operating and generally make their presence known to the Taleban. Ground forces saw an immediate lull in enemy activity as the Taleban attempted to assess the capabilities and intentions of the squadron.

The action quickly intensified for VMA-214, with squadron pilot Capt Charles George describing a typical mission during the summer of 2009;

'On patrol, Marines from 2/8 found themselves pinned down by heavy direct and indirect fire. They were unable to see the enemy as accurate fire struck all around them. An AV-8B that had checked in moments before located the enemy position and, 30 seconds later, the deafening sound of a jet engine was drowning out the sound of gunfire as the Harrier II blazed overhead at 300 ft and more than 500 knots. The enemy fire abruptly ceased as the jet passed directly over them, dispensing flares. The Marines took advantage of this lull by regrouping and seeking tenable fighting positions as mortar fire, impacting as close as 150 metres from friendly troops, kept the pressure on the enemy.

'Today's enemy is a dedicated adversary, and the Taleban fighters were only momentarily discouraged by this show of Marine air and superior firepower. The 2/8 Marines once again found themselves taking heavy fire. The next time the Harrier IIs flew over it rained down 25 mm SAPHEI-T [Semi-Armour Piercing High Explosive Incendiary-Tracer] instead of flares. As the smoke cleared from the remnants of the enemy position, it was clear to the Marine patrol that the firefight had come to an abrupt end. "Dash Two", holding at 30 seconds in trail and waiting for another gun run, was told to abort. The enemy had fled.'

Considerable effort went into keeping VMA-214's ten Harrier IIs airworthy in order to meet the unit's punishing operational tempo. Some 200 Marines assigned to the unit worked alongside personnel from Marine Aviation Logistics Squadron (MALS) 13 on the maintenance of the aircraft. 'We anticipated that our pilots would fly 40 hours per month

More than 290 tons of poppy seeds seized by Marines from the 2nd Light Armored Reconnaissance Battalion, Marine Expeditionary Brigade-Afghanistan, in Safaar, in Helmand Province, are destroyed by three 1000-lb bombs dropped by Harrier IIs from VMA-214 on 21 July 2009. Onlookers reported a rolling cloud of sand gliding over them shortly after the blast (*US Marine Corps*)

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A VMA-214 jet armed with GBU-38 JDAM receives fuel from a VMGR-352 KC-130J in flight over southern Afghanistan. Aerial refuelling helped extend the range and loiter time of VMA-214's AV-8Bs in OEF, with co-located VMGR-352 providing most of the fuel passed to jets from the unit. The KC-130J offers a 57,500-lb fuel offload capacity, using wing and external tanks, while in the air. It is also equipped with a removable 3600-gallon aluminium fuel tank that is carried inside the cargo compartment, providing additional fuel when required. The KC-130J can refuel fixed or rotary-wing aircraft using standard probe and drogue equipment (*E Schaefer*)

flying while in Afghanistan, but we ended up flying a lot more – some aircraft exceeded 90 hours a month', explained Maj James T Bardo, VMA-214's aviation maintenance officer. 'I am proud that we were able to have around 80 percent of our jets fully mission capable at the start of every flying day, despite being on the end of a very long supply line'.

The unit also received support from Boeing's AV-8B Field Service personnel, including Pat Wilson;

'Harrier II operations from Kandahar and Bastion [where the RAF's Harrier GR 9s were located] were considerably different from most other sites we had supported over the years. The elevation of the airfields was roughly 3200 ft and 3600 ft, respectively. This in itself degraded engine performance so significantly that full hovering of the aircraft was not possible. Tyres, wheels and brakes required special attention while operating from these airfields too. Blown main and outrigger tyres were not uncommon due to the heavy landing loads (tanks, Lantirn II pod and often two bombs and ammunition) associated with OEF. The added heat from fast, heavier landings took its toll on the braking systems. Due diligence was also given to the brakes, tyres and surrounding areas for heat-related damage. On many occasions, when brakes were inspected drive clips were found cracked around the rotors – a condition we had not seen for quite a while during peacetime operations. Another heat related effect was heavy oxidation and erosion. Brake assemblies were carefully monitored for this condition.'

During almost seven months of operations the ten VMA-214 jets flew 3084 combat hours (2798 of these hours were flown in only four months) and 1374 sorties, dropping more than 20,000 lbs of ordnance while performing CAS, armed reconnaissance and attack missions. While in Afghanistan VMA-214 exceeded all statistical records for flight hours, mission readiness and aircraft utilisation rates set by other Harrier II squadrons, including those involved in OIF.

Lt Col Thomas Gore served as the Future Plans Officer for MAG-40 in OEF from April 2009 through to March 2010, and he was able to fly Harrier II missions throughout the deployment;

'During MAG-40's time in Afghanistan my primary job was to coordinate, supervise and refine the aviation planning efforts for all company-sized heliborne assaults that we executed. Marine Harrier IIs were integrated into most of these offensives, conducting initial terminal

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VMA-214 comes together for a squadron photo at Kandahar on 12 October 2009. During almost seven months of operations the ten VMA-214 jets in-theatre flew 3084 combat hours (2798 of these hours were flown in only four months) and 1374 sorties, dropping more than 20,000 lbs of ordnance while performing CAS, armed reconnaissance and attack missions (*E Schaefer*)

guidance, reconnaissance and on call CAS. I got to fly with VMA-214 and VMA-231 when the latter unit replaced the "Blacksheep" within MAG-40 in November 2009. VMA-214 had arrived in Kandahar in May 2009 and played an instrumental role in Operation *Khanjar* in early July – the MEB-A's initial heliborne assault into the Helmand River valley [and the largest US Marine Corps offensive since the Battle of Fallujah, in Iraq, in 2004]. VMA-214 maintained superb readiness rates throughout its time in OEF and greatly helped the Marine infantrymen they were supporting.'

As noted by Lt Col Gore, VMA-231 replaced VMA-214 within MAG-40 in November 2009. Although the unit was based at Kandahar, some of the ten aircraft assigned to VMA-231 started flying from the newly expanded Camp Dwyer from January 2010. Dwyer was a FOB in the Helmand River valley, in the Garmsir District, that had initially been established for helicopters but was expanded to accommodate AV-8Bs by Marine Wing Support Squadron (MWSS) 372. 'By the time the job was finished we had constructed the largest expeditionary airfield since Vietnam for fixed wing aircraft', explained Lt Col Matthew Puglisi, commanding officer of MWSS-372. 'In addition to improving the runway, we also added a north parking ramp, Tactical Airfield Fuel Dispensing System and connecting taxiways to enable more aircraft to land, refuel, rearm, park and take off. These improvements decreased the amount of time an aircraft spent refuelling and increased the amount of time it could support the Marines on the ground'.

AV-8B Harrier II+ BuNo 165594, assigned to VMA-231, is flown by Capt McLin along the eastern Afghan-Pakistan border on 30 December 2009 (*Needham*)

Soon after VMA-231's arrival, the MEB-A conducted the final clearance of Now Zad, in northern Helmand Province. Codenamed Operation *Cobra's Anger*, this offensive was supported by Harrier IIs, 'which oversaw a heliborne assault during tough, challenging winter weather conditions', recalled Lt Col Gore. 'As this operation got underway, the MEB-A was furiously

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planning for a much larger assault – Operation *Moshtarak* – in February 2010. Part of the ISAF pacification offensive in Afghanistan, its main aim was to remove the Taleban from Marja, thus eliminating the enemy's stronghold in central Helmand Province.

'Due to the potential for significant Taleban resistance, MAG-40 sought to capitalise on the Harrier II's expeditionary basing capability and surge the AV-8Bs in support of the Marja operation. FOB Dwyer is located about 20 miles due south of Marja, and at that time was the home of Regimental Combat Team [RCT] 7 – the ground combat element for the Marja assault. At the time, Dwyer boasted an expeditionary runway that was only 4250 ft long and less than 100 ft wide. Only one attack jet in the world can take off from and land on a runway that short while carrying a full combat load – the AV-8B.

'The use of FOB Dwyer by MAG-40 and VMA-231 completely validates the operational premise of the AV-8B. Marine Harrier IIs have certainly operated from austere FOBs in other conflicts, but VMA-231's operations in support of the Marja campaign were unique because the runway was so short and Dwyer was located so close to the regimental assault. The AV-8B's STOVL capability allowed VMA-231 to dramatically reduce transit time to and from Marja, eliminate the need for tanker support, drop external fuel tanks and carry more ordnance. It also ensured very high sortie rates. Having the FOB and RCT headquarters co-located also facilitated a very tight integration between VMA-231 and supported manoeuvre battalions. The Harrier II pilots provided great support throughout this operation, and all of the others that they flew in during the deployment.'

Lt Col David Forrest was CO of VMA-231 throughout its time in-theatre, and he recalled the build-up to the deployment;

'We were initially on the hook to go to Iraq, and still did not know that we would be heading to Afghanistan instead. I sent the squadron to Barksdale AFB, Louisiana, for a *Green Flag* exercise, then we went to NAF El Centro, California, and delivered live ordnance, and finally we moved out to Bogue Field, North Carolina, for fixed base operations, day and night, so that we could get everyone NVG qualified. It was at around this time that we found out we were going to Afghanistan, so the squadron finished its training for deployment by moving to the forward field at Twenty-Nine Palms to fly with the MCAGCC in September 2009, where it was hot and sandy and we flew in support of Marine ground units. All of this training paid off handsomely once we were in-theatre providing CAS for troops on the ground.

'We worked particularly hard on getting additional training for the younger pilots that would be deploying for the first time. Today, the AV-8B is so well integrated with good targeting systems and effective weapons that once you detect a target you almost never miss it. However, we initially found that our junior pilots were so engrossed with operating the targeting pod and other aspects of the jet's systems that they would not look outside the cockpit and maintain a good scan pattern. During work-ups I made my guys fly together in section spread and manoeuvre as a pair when acquiring a target, which in turn forced them to keep a visual check on their positions relative to each other, before actually delivering any ordnance. We quickly found that this provided the junior guys with more effective training.

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VMA-231 flagship Harrier II+ BuNo 164662, complete with special tail markings, patrols over Afghanistan on 22 January 2010 (*Needham*)

'In the weeks leading up the deployment we selected ten jets that we were going to take to Kandahar. Our sister-squadron at Cherry Point, VMA-223, allowed us to take the pick of its aircraft too, thus making sure that we had the best jets possible. It also helped that we had the overhaul depot there at Cherry Point to ensure that all the latest mods had been installed in the aircraft, and the jets' paintwork was newly applied, before we deployed. We only sent radar jets that had been fully upgraded to Afghanistan.

'Our maintenance officer, Maj Ben Hutchins, made sure our jets had had Airframes Change 479 completed, which allowed us to carry the Litening II pod on centreline station No 4 and fuel tanks on stations Nos 3 and 5 prior to heading to OEF. This mod enhanced the handling of the aircraft as the forces associated with asymmetric loads were reduced and we could fly up to 5.5Gs with the tanks inboard. The improved handling characteristics of the AV-8B allowed us to concentrate on making more effective use of the GAU-12 25 mm gun. This weapon was paramount for our operations in Afghanistan due to the more restrictive ROE that was now in place in OEF. We used the gun a lot as a direct result of these mods. Our jets with the centreline mod for the Litening II pod could carry a GBU-38 JDAM, a GBU-12 LGB, the targeting pod, fuel tanks and the gun, which gave us tremendous flexibility. Our GBU-38s and GBU-12s could be fitted with the new BLU-126 low collateral blast warhead so as to make the ordnance better suited to the more selective ROE that was now in force in Afghanistan.

'Maintenance for the AV-8Bs once in-theatre proved to be hard work, just as we expected it to be. Fortunately, we had hangars at Kandahar where we could do the heavy work, and they were needed as we were there in the winter when it gets cold! We also experienced hail and sand storms. While the squadron was at Kandahar we did our best to keep the runway clear of FOD. However, it was the busiest single runway airport in the world at that time, so it was tough. We had minimum taxi speeds, nozzles down, so we did not blow debris around, and made sure that there was plenty of separation between aircraft. We also made sure that we left sufficient time for the taxiways and runway to be checked after large aircraft and helicopters had taken off immediately prior to our departure. FOD was a constant focus for VMA-231, and we did a lot of sweeps with the dolly after most takeoffs and every sandstorm.

'I recall after one particularly heavy rainstorm mud shot up through the AM-2 steel matting that was used in the construction of the taxiways. We let it dry and then went out with brooms, leaf blowers and screwdrivers to clean up the debris.'

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Once in combat over Afghanistan, Lt Col Forrest was impressed by the advances that had been made in the command-and-control of TACAIR assets since he had seen action in OIF II five years earlier;

'Our command-and-control was good in Afghanistan. Let me give you a comparison. When I flew off *Bonhomme Richard* in OIF II with VMA-513 as part of the 15th MEU in 2005, the pilot was the interface between the targeting pod and the jet. If I saw something on the ground, I had to take the coordinates from the screen and manually enter them into the jet's mission computer. In 2010 we had AV-8Bs that had integrated mission software that could do this automatically, plus we had JDAM capability.

'Many times in Afghanistan the command centre had already done basic reconnaissance of the areas where Marines were operating, using UASs and other sensors. When we checked in our pilots would get a set of coordinates of an area where command thought something might be going on, like the potential for an ambush. We would enter the numbers into the targeting pod and it would look there and give the FAC or air officer our ROVER codes so that they could see what we saw. They would then say, 'Look here', so we would have a valid DMPI [Designated Mean Point of Impact] to evaluate and attack. This is ISR at its best.

'The command centre used Shadow or Scan Eagle UASs costing perhaps $100 per hour to run, and they could remain on station for many hours to monitor the situation on the ground and prepare for the most effective use of fighter aircraft costing $3000 per hour to run that were available for perhaps an hour at most. Thanks to this improved command-and-control, fast movers were more effective, the troops on the ground received valid support and the FAC and command centres knew what was going on in real time.'

Lt Col Forrest's XO for the first three months of VMA-231's deployment was Maj Shawn Hermley, who like his CO had also seen action in OIF;

'Flying over Helmand Province in 2009-10 was very different from what I had experienced flying in Al Anbar Province, Iraq, in 2007 while serving as regimental air officer with Regimental Combat Team 6. Helmand was more rural and more spread out, lacking any well-developed infrastructure. It was evident that Helmand Province had been without a centralised government for quite some time. Enemy activity was also initially less frequent in Helmand than during the early months of my deployment to Iraq, hence the use of aviation fires was also relatively infrequent. We also had more restrictive ROE in Afghanistan, particularly when it came to the employment of bombs. Indeed, "Bomb" was almost a dirty word amongst our customers – US and NATO ground commanders.

'During the first three months of our deployment the squadron only employed ordnance twice. Once was in support of troops-in-contact, with two 25 mm gun runs, and the second time was a pre-planned attack on a building used by the Taleban, onto which we dropped two GBU-38 JDAM.

'Our daily mission in support of Regional Command (Southwest) [RC(SW), which is one of six regional commands operating in Afghanistan under ISAF control] was airborne-alert CAS, which meant that we were on-call to be redirected to a ground force requesting an attack aviation asset, usually in response to a firefight with the enemy. While we were 'on-call', we provided Non-Traditional Intelligence, Surveillance, and Reconnaissance [NTISR] in direct support of NATO ground forces,

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Marines from MWSS-372 stand by to conduct final inspections on an AV-8B Harrier II+ from VMA-231 as soon as refuelling of the aircraft is completed at Camp Dwyer on 10 February 2010. The jet is carrying a GBU-38 JDAM beneath its left wing (*US Marine Corps*)

usually US Marine Corps battalions – the NTISR mission has since been renamed Multi-sensor Imagery Reconnaissance [MIR] since it is no longer "non-traditional". We would orbit overhead friendly forces, using the Litening II pod to collect intelligence, search for enemy fighters and/or provide over-watch of friendly patrols/convoys while the battalion FAC or JTAC watched our full motion video downlink and directed our sensor.

'We rarely conducted aerial refuelling during our daily sorties, unless we were supporting a named operation where it was desirable to have at least one aircraft overhead at all times. The Marine KC-130s were, in any case, being used extensively for logistics in an attempt to reduce the number of convoys being sent out to FOBs, as these were proving highly vulnerable to IED attacks. Each AV-8B section would conduct two sorties per day, providing about 1.25 to 1.5 hours on-station, then return to Kandahar for hot refuelling and take off again on a second sortie. All in all, you could expect to spend around five hours in the cockpit – two hours airborne, one hour on-deck being refuelled and rearmed and two hours airborne again. There was also time spent on pre- and post-flight briefings.

'Our working areas along the Helmand River ranged 80 to 100 nautical miles from Kandahar. In the counter-insurgency fight, the name of the game was to maximise time-on-station because the "kill chain" [sequence of events from target detection through to weapon on target] could be a rather long process due to ROE and the various approvals that were required. Therefore, our standard load included external fuel tanks, which provided additional time-on-station at the expense of two PGM stations.

'With "Bomb" being a dirty word in-theatre at the time, we knew well ahead of our deployment that the GAU-12 25 mm five-barrel Gatling gun was going to be our primary weapon. The squadron trained extensively with the gun prior to entering combat. The criteria for gun employment was less restrictive within the ROE and the various Tactical Directives issued to all TACAIR assets in OEF. Strafing passes required a significantly reduced level of approval authority and, hence, improved the likelihood of a timely engagement with ordnance.

'The GAU-12 is very accurate when employed properly. The most challenging aspects of strafing are the requirement to dive – a coordination challenge in congested airspace – and the visual acquisition of the target by the pilot before he can commence firing. With the latter, the pilot has to shift his view of the target from the Litening II pod to his HUD.

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'The airspace over the Helmand River was certainly congested, as virtually everyone who lives in the province resides next to the river within the "green zone" – the farmland and villages supported by the river. Jet aircraft generally like to be at high altitude to conserve fuel, to remain above the threat and to optimise PGM effectiveness. During counter-insurgency operations in both Iraq and Afghanistan, TACAIR jets have operated at lower than typical altitudes in order to maximise the fidelity of the targeting pod video, and also to reduce the number of other aircraft beneath them that would need to be moved out of the way in case of a diving attack – the preferred profile for the gun or the AGM-65E Laser Maverick missile.

'Therefore, during VMA-231's first few months in Afghanistan, we continually pleaded with the DASC to insert the AV-8Bs lower in the stack and place the theatre-level UASs at higher altitudes to make more effective use of their superior sensors. This would have given AV-8B pilots the opportunity to rapidly employ the gun without having to wait for a slow UAS to transit out of the way. Eventually, the make up of the stack improved, but it wasn't perfected until final preparations for Operation *Moshtarak*.

'About a month prior to the eventual start of *Moshtarak*, additional airspace control measures were instituted over Marja in order to work out the bugs of airspace control prior to execution of the operation. A large High Density Airspace Control Zone [HIDAZ] and a smaller Restricted Operating Zone [ROZ] within the HIDAZ were created, these being run within RCT 7's Operations Centre by an Air Support Liaison Team. The latter controlled aircraft within the larger HIDAZ, while the regimental air officer guided aircraft and fires within the ROZ. Throughout January 2010 the bugs in this new system of command-and-control were effectively worked out, with RCT 7 giving us the priority airspace block that we had been asking for from the start. Theatre-level UASs were now operating at higher altitudes, allowing more rapid gun employments for the AV-8Bs.

'VMA-231 planned and prepared to provide the best CAS we could for the difficult ground fight that we expected in Marja. The ISAF was open about its plans to clear the town of Taleban fighters, heavily publicising *Moshtarak* before it was launched and comparing its scope and size to the 2004 Second Battle of Fallujah in the hope that Taleban fighters in the town would flee. Conversely, those insurgents who chose to stay had plenty of time to prepare defences.

'In the weeks prior to the offensive we analysed ordnance load-outs and basing options. We knew we'd have the KC-130s available for the first few days of the operation, and possibly other aerial refuelling platforms too. However, you can't reload ordnance while airborne, and the 80 miles between Marja and Kandahar was not ideal – at least a 20-minute one-way transit, plus significant ground delays at a very busy airport.

A refuelling crew from MWSS-372 replenish the tanks in a VMA-231 jet at Camp Dwyer on 13 February 2010 – the day Operation *Moshtarak* commenced. This forward site eliminated a long flight to and from Kandahar and allowed for extended air support for Marine ground forces. This particular aircraft is armed with a GBU-38, a GBU-12 and GAU-12 25 mm cannon (*US Marine Corps*)

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MAG-40 initially looked at using Camp Bastion airfield as an AV-8B refuelling and ordnance reloading location, but it was already extremely congested with rotary wing and fixed wing cargo aircraft. We ultimately settled on using Camp Dwyer as our ordnance reloading point. It was literally underneath the south CAS stack for Marja, being just 20 miles south of the town. We initially started flying into Dwyer in early January, rotating a small detachment of Marines into the site in order to conduct hot refuelling and hot reloading.

'On the first day of Operation *Moshtarak* on 13 February 2010, all of the squadron's planning and preparations really paid off. Every AV-8B section conducted multiple 25 mm gun attacks. We also performed aerial refuelling with KC-130s, with the game plan of dropping into Camp Dwyer if we needed to reload bombs. On subsequent days of the operation we used Camp Dwyer exclusively, which worked extremely well. We actually lost time-on-station going to tankers since you had to keep enough gas to go both to the tanker and to an alternate airfield in case you couldn't get fuel from the KC-130. It was actually easier for us to land at Camp Dwyer because it was directly under the CAS stack, which meant we didn't need to reserve the extra fuel required to meet a tanker. Our quickest turn on deck in Dwyer was 19 minutes – to land, get gas and get back on station. This was the Harrier II's design concept at its best, the jet operating from a forward base close to the fight in order to maximise sorties. With the AV-8B, we could deploy to places that no other jet could go to.

'Just prior to *Moshtarak* commencing, MWSS-372 tied in the last section of AM-2 matting that increased the length of the runway to about 6000 ft. The other great thing about Dwyer, and the forward basing concept, was that RCT 7's Headquarters was located here, and pilots were able to talk face-to-face with the regimental air officer while jets were being refuelled and rearmed. We would then take off from Camp Dwyer having already received our airspace assignment, our situation update and details of the battalion we were going to work for.

'*Moshtarak* had been underway for exactly a week when I flew my last mission with VMA-231 on 19 February, prior to my early redeployment to VMA-542. It turned out to be a memorable flight with Maj Toby Buchan, who was the squadron's Operations Officer and a good friend – we had started our Harrier II careers together in the same AV-8B class at VMAT-203, then served together in the unit as instructors, before joining VMA-231 as XO and Ops O, respectively. It was rare to have

Two VMA-231 AV-8B Harrier II+s wait their turn to be refuelled and rearmed at Camp Dwyer on 10 February 2010. Note that BuNo 165355 in the background is painted in standard two-tone grey camouflage while BuNo 165004 in the foreground boasts the new darker camouflage scheme – its replacement canopy is still a lighter shade of grey, however. The new scheme was applied as aircraft went through major overhauls at MCAS Cherry Point, and it has taken years for the entire fleet to make the transition (*US Marine Corps*)

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two senior pilots in the same flight, and Toby and I hadn't flown together while we were in Afghanistan.

'We had executed our first mission and landed at Dwyer for gas. When I called the regimental air officer while refuelling, he gave us a battlefield update and then asked me, "Are you ready to make history?" The answer was an inquisitive "Sure". He let us know that we'd be going to Alpha Company, 1st Battalion, 6th Marines, which was in a firefight. Their battalion air officer, Capt Alex Ramthun, wanted to execute a digital nine-line.

'The AV-8B had had the capability to receive a digital nine-line CAS brief since I had started flying the aircraft in 1998, the message being transmitted via the jet's ATHS. However, FAC/JTACs didn't have the equipment via which to transmit a briefing digitally until the relatively recent fielding of the Strike Link ground-based system. Both AV-8Bs and F/A-18s routinely conducted digital CAS in training with FACs and JTACs at home using Strike Link, but it had never been used in combat.

'Once we were airborne after refuelling at Dwyer, we checked in with the battalion air officer and he passed us the nine-line data via a digital burst. We confirmed it so as to meet theatre requirements, locked onto the target with the Litening II pod and each delivered a GBU-51 [a GBU-12 fitted with a BLU-126 low-collateral blast warhead) into the target building. This event was memorable for me personally because it was the first time a digital nine-line brief had been used in combat, it was the first time I had employed a bomb against the enemy and it was my last flight with VMA-231 during this deployment. At the time I thought it might also be my last flight in combat, period. Fortunately, I would have the opportunity to lead VMA-542's *Kearsarge* detachment in action over Libya in 2011 and then take command of VMA-231 during its Camp Bastion deployment in 2012-13.'

Capt Keith Bucklew also flew with VMA-231 in OEF in 2009-10, having previously seen combat in Iraq with VMA-513 in 2006;

'We got a lot better tasking in Afghanistan than Iraq. When flying in OIF, we would take off and there may or may not have been a tasking for us. Also, the scale of the operation in Iraq was considerably larger – there were a lot more assets in-theatre. When I was there in 2006 we had both a Harrier II unit and a Hornet squadron at Al Asad, so there were plenty of TACAIR assets available. This often meant you received no tasking when on patrol, and the missions soon became very repetitive.

'However, in Afghanistan, Marine TACAIR was limited, so when you got tasked and got on station they had stuff for us to do. Our ten jets were it in regards to Marine TACAIR in 2009-10. When we checked in they nearly always had a target for us. We got a lot better at tasking assignments and with using ROVER for ISR. ROVER makes it a lot easier for the ground forces, and the command group can make better use of you as they can see what you are looking at from the jet. When I was in Iraq we had analogue ROVER receiver and antenna problems, which limited the system's use. From 2007 we moved to digital ROVER pods, with better antennae and more powerful receivers that meant the system's operational range increased and ROVER started to be a real asset in-theatre. By the time I went to Afghanistan in 2009 ROVER was a critical, and reliable, tool that made us far more effective at ISR.

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Pilots from VMA-231 pose in front of the flagship bird 01 on 14 April 2010. Standing in the back row, from left to right, are Maj David Martin, Capt Philip Ash, Lt Col David Forrest, Majs Toby Buchan and Benjamin Hutchens, Lt Col Joseph Williams and Capts Mathew Seaviette, William Nelson and Robert Needham. In the front row, from left to right, are Capts Brian Gerschultz, Eric Scherrer, Michael Bell, Adam Campbell, Ross Fearon, Lee Stanbridge and Keith Bucklew. During the unit's six months in-theatre these Marines had flown more than 8000 hours between them (*VMA-231*)

'I was there during the Marine RCT *Moshtarak* offensive, and the troops got into many nasty fights. The offensive was kinetically active at the start, but things soon got really tight as troops cleared Marja, which meant that we did not knock down a lot of buildings as a result. We carried plenty of low collateral damage LGBs, few of which we dropped, but we did perform a number of strafing attacks. The gun became the weapon of choice for the targets we were presented with, and we did well with it.'

Maj Joseph Williams joined VMA-231 as Maj Shawn Hermley's replacement in February 2010, the OIF veteran quickly seeing action with his new unit;

'I found that our missions in OEF were similar to those that I had flown in Iraq, using our Litening II pods to look for the enemy as we flew overhead ISAF patrols. We had to be ready to respond to troops-in-contact calls or in the wake of IED attacks. Although we usually carried four LGBs, a Maverick missile and the gun, the weapons we used changed as the ROE grew progressively more restrictive. Eventually, we came to rely almost exclusively on the gun, which proved to be particularly effective against insurgents caught planting IEDs or Taleban fighters firing on friendly troops. The FAC would drive the approach angle to the target, and as we had ROVER we could watch the development of the situation on the battlefield. A typical call from a FAC during this type of engagement was "That is the guy, strike him", our target being clearly visible on the ROVER feed.

'Conversely, in other situations, the FAC used his ROVER monitor to view real time imagery from our Litening II targeting pod in order to tell us that friendly troops or civilians had walked into the target area, thus forcing us to call off our impending attack.

'Undoubtedly the biggest difference for me in OEF in comparison with OIF was the integration of UASs into everyday operations. We relied heavily on them for target ID in particular, with their sensors and their dwell time being superior to what we could offer with a Litening II-equipped AV-8B.'

By the time VMA-231 was replaced by the F/A-18Cs of VMFA-232 at Kandahar in May 2010, the Harrier II unit had flown more than 8000 hours in Afghanistan. It had supported more than 100 named operations, 750+ Joint Tactical Airstrike Requests (JTAR), fired more than 4600 rounds of 25 mm ammunition, expended five LGBs and conducted 41 CAS attacks.

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THE SURGE

During a speech given at the US Military Academy at West Point on 1 December 2009, President Obama announced that he was sending an additional 30,000 US troops to Afghanistan to counter Taleban advances. Included in this number would be 8000 more Marines. More Coalition troops would also be committed to OEF to help maintain security in-theatre and to expand the training of the ANA and the police force.

Providing CAS in-theatre, even with the new restrictive ROE firmly in place, continued to be a critical element of the ISAF strategy. As previously noted, in May 2010, following the departure of VMA-231, MCAS Miramar-based VMFA-232 became the first Hornet-equipped unit to be deployed to Afghanistan. Assuming responsibility providing air support to the Marines in-theatre, the unit flew from Kandahar until relieved by VMFA-122 from MCAS Beaufort, North Carolina, in late November 2010.

'The plan was to have Harrier IIs and Hornets share the commitment in Afghanistan', explained Col Anton Nerad, CO of MAG-13 in 2010-11. 'From 2003 Harrier IIs had Iraq and MEU deployments while the Hornets performed war deployments and supported the US Navy with TACAIR integration, so both communities were heavily tasked. However, Marine TACAIR's OIF commitment ceased in 2008-09, just as things got worse in OEF. I went over to Afghanistan shortly thereafter for a brief command tour, which allowed me to assess conditions in-theatre and the situation on the ground. Compared to the facilities we enjoyed at the former Iraqi air force base at Al Asad, Kandahar was far more austere, with only one runway. Despite this, the base was incredibly busy, with TACAIR, transports and UASs all sharing the same runway and its associated facilities'.

Despite Kandahar seemingly creaking at the seams with aircraft, VMA-513 became the first Harrier II unit committed to OEF in a year when its ten jets landed at the base in May 2011 to replace VMFA-122

AV-8B Harrier II+ BuNo 165574 from VMA-513 and F/A-18C Hornet BuNo 164255 from VMFA-122 fly a joint patrol over Afghanistan. Following VMA-513's arrival at Kandahar on 21 May 2011, the unit flew a number of missions alongside VMFA-122 during the first three days of the squadron's deployment as Hornet pilots showed their Harrier II brethren how things were done in OEF (*US Marine Corps*)

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as the 2nd MAW's principal fixed wing TACAIR asset. 'Preparing the squadron for its Afghanistan tour was a challenge', Col Nerad recalled. 'When we were notified that MAG-13 was to send a squadron of Harrier IIs to Kandahar we were still in the middle of getting all of our AV-8Bs modified to carry the Litening II pod on the centreline station.

'When the targeting pod was bolted onto one of the wing stores pylons, we were limited in the mix of ordnance we could carry. If the Litening II pod was on a wing station, that was one less PGM the jet could be armed with. If you carried a targeting pod under the wings you could only arm the jet with a single JDAM because of the wiring installed in the Harrier II – we did not have Digital Improved Triple Ejector Racks at that point in time. My priority was to give the upgraded aircraft to the MEU detachments as the centrally mounted pod helped with weight and balance issues when operating off the boat. Since you always have to land vertically on the boat, you cannot have asymmetric loading.

'The MEU units had a busy deployment schedule, which in turn meant that getting modified jets available in time for their various embark dates was tricky. We worked a plan out with the PMA [Program Management Activity] that saw us buy pylon modification kits early and the fleet readiness centres organise the labour to modify as many of the aeroplanes as they could handle as quickly as possible. With everything in place, we cycled jets through the modification process fast enough to allow MAG-13 to have upgraded Harrier IIs available for both the MEUs and VMA-513's deployment to Afghanistan.

'Nevertheless, we had to transfer a number of modified AV-8Bs from different squadrons at Yuma to VMA-513 in order to get the unit up to strength for OEF. In the end, the squadron went to Afghanistan with all ten of its jets able to carry the Litening II pod on the belly station. This in turn meant that these Harrier IIs had greater flexibility in the ordnance they could carry into combat. We also repainted some of the jets in a darker shade of grey, which made them harder to see. As a bonus, the new paint was also a little lighter as well.'

Col Nerad worked closely with the CO of VMA-513, Lt Col Peter Lee, in the run up to the unit's OEF deployment. 'We knew well in advance that we were going to deploy to Afghanistan with ten of our jets, 17 pilots and a full set of maintainers', Lt Col Lee explained. 'At Yuma, we are lucky enough to have the Chocolate Mountain Aerial Bombing and Gunnery Range and the Barry M Goldwater Air Force Range close by, giving us plenty of opportunity to drop live ordnance during pre-deployment training. The weather is also exceptional most of the time.

'Col Nerad and MAG-13 did a great job of preparing us for our time in Afghanistan. This included helping us with aircraft maintenance and critical upgrades and providing us with realistic training for both my pilots and my support personnel. We had a fantastic two-week training detachment to Nellis AFB, where we honed our CAS skills while working with USAF, German and Dutch JTACs. We also went to Twenty-Nine Palms and flew with Marine battalions, delivering a lot of ordnance and talking through scenarios, tactics and ROE with MCAGCC instructors. This really prepared us for our deployment.

'As previously explained, we also reconfigured all of our jets with the centreline mod for the Litening II pod. Col Nerad pushed this mod on

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me, and I was a little reluctant at first to go with the change because "it was late in the game". I had tried hard to avoid all the last minute maintenance work that was required to make this mod happen due to the adverse effect it would have on our pre-deployment training cycle. We needed the squadron, MAG-13 and Boeing contractors at Yuma to work hard to have the jets upgraded in as short a time as possible. In the end Col Nerad was correct in pushing for the mod to be done, as we enjoyed far more flexibility with the aircraft once in-theatre.

'There was also a perception issue associated with the pylon upgrade, as we could now carry two bombs and two external tanks – an identical war load to the Hornets we were replacing at Kandahar. The F/A-18Cs that had been committed to OEF since May 2010 had arrived in-theatre with this capability, having replaced Harrier IIs that were limited to carrying only a single bomb when fitted with an underwing targeting pod.'

Unfamiliar with the increased weapons flexibility of the modified jets assigned to VMA-513, senior officers in the MAGTF at Kandahar had initially expressed concern that the 12 Hornets of VMFA-122 were being replaced by only ten AV-8Bs. 'Senior officers in-theatre thought that they would lose out with reduced capability – we could not cover as many stations, response time etc.', recalled Col Nerad. 'As MAG CO, I sent an advanced party there to make sure that everything was set up for a seamless transition. We did a good assessment, made sure we had things covered and let the leadership know that we were sending them the most advanced Harrier IIs with improved capabilities. We told them that we thought we could match the sortie rate of 12 Hornets with ten Harrier IIs, and with the new pylon configuration carry a similar load of weapons. A lot of folks did not believe us, but I think we covered the same number of JTARs as VMFA-122.

'When we flew with two drop tanks and an identical weapons load to the Hornet, which was also carrying two drop tanks, we did very well. The F/A-18C had a higher dash speed, but in the end we provided about the same target coverage. With the Harrier II centreline modification we had the targeting pod there and could carry two fuel tanks, a JDAM and a LGB, plus the gun and a mix of other weapons. The Harrier II's 25 mm cannon is also a much more effective weapon than the M61 20 mm gun fitted in the Hornet and the F-16. Rounds fired from the GAU-12A have a superior muzzle velocity of 3700 ft per second, plus they are considerably larger. Although a devastating weapon, the 25 mm cannon is not in the same leagues as the GAU-8 30 mm cannon fitted in the A-10 – our gun sits between it and the M61.'

Following VMA-513's arrival at Kandahar on 21 May 2011, the unit flew a number of missions alongside VMFA-122 during the first three days of the squadron's

The officer cadre of VMA-513 line up for a group photograph whilst en route to Kandahar on 17 May 2011. They are, from left to right, Capts Nick Dimitruck, Aaron Fry and Tommy Ragsdale, Lt 'Nati' Paul (US Navy), Capt Anthony Defurio, Lt Col Peter Lee, CWO2 Kevin Relph, Capt Paul Truog, Maj Luke Jacobs, Capts Dan Fletcher, Trevor Sutton, Derek Mills and Par Ubhi, Maj David Slay, 1Lt James Moore and Capt Tyler Sanders. Behind them is their command jet, AV-8B+ BuNo 165580 (*VMA-513*)

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deployment as Hornet pilots showed their Harrier II brethren how things were done in OEF. 'It is unusual for two different TACAIR fixed wing jet types to fly as a section during combat operations', explained VMFA-122 pilot Capt Jonathan Reed. 'In fact I would say it was a milestone event. Flying a mixed section presented no problems to either unit, however, as both pilot communities are very well versed in CAS'. VMA-513 pilot Capt Andrew Biddell agreed, remarking, 'That was the first time I had worked closely with the Hornet in combat and, personally, I encountered no problems at all during the sorties I flew with VMFA-122'.

Lt Col Peter Lee was instrumental in arranging for his unit and VMFA-122 to fly these sorties during the hand over period;

'The pilots from the departing squadron would fly some missions with an advanced party from VMA-513 so that we would have a better understanding of the situation on the ground, air traffic control procedures, ROE, terrain and the movement of ground forces. I had arranged this after talking with the CO of VMFA-122, Lt Col John Bolt, who was an old US Naval Test Pilots School buddy of mine – we had also gone through basic school together in 1991. We subsequently observed Hornet ops for three days, being briefed on the lessons the unit had learned and receiving instruction on the ROE by Marine lawyers, FACs and pilots. Lt Col Bolt then let us fly several mixed station sorties to provide training. These missions made a big difference in the effectiveness of the squadron turnover. Within a few days of us arriving in-theatre the Hornets were flying the morning and evening sorties and the Harrier IIs conducting the midday and night missions, until we took overall responsibility for air support in the AOR. This was the first time that I know of in all the years we have provided support in Iraq and Afghanistan that we have flown mixed Marine TACAIR sections.

'Lt Gen Glenn Walters, commander of the 2nd MAW (Forward), and his deputy, Col Ben Hancock, made sure the transition from Hornet to

VMA-513 became the first land-based US Marine Corps AV-8B squadron to employ a laser-guided GBU-54 JDAM in combat in July 2011. This 500-lb guided bomb gave Harrier II pilots the ability to target fixed positions (like an insurgent stronghold) with GPS technology, as well as undertake precision strikes on moving targets by using the bomb as a laser-guided weapon. This aircraft, photographed at Kandahar on 22 July 2011, has a GBU-54 beneath its right wing on the stores pylon usually reserved for the Litening II pod. The latter, again in a first for a US Marine Corps Harrier II unit, is centrally mounted under the fuselage of the aircraft (*US Marine Corps*)

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Harrier II went smoothly, and that the Marines were supported properly on the ground during the handover period. We received excellent higher HQ support, with the 2nd MAW proving to be receptive to any proposals we had that would help provide CAS for our Marines in the field.

'When we first got to Afghanistan the operational envelope for the GBU-54 500-lb laser JDAM [a GBU-38 JDAM fitted with a laser seeker head, allowing the weapon to engage both stationary and moving targets on the ground with a reduced risk of collateral damage] was still being tested by the specialists at NAWS China Lake, so we had only a limited capability with this weapon. There was plenty of dialogue between the China Lake test communities and the 2nd MAW, and a GBU-54 subject matter expert came to Afghanistan and worked with us. What was gratifying was the fact that this dialogue slowly expanded the capabilities of the weapon while we were there. The situation went from "You have to know the complicated ROE for the weapon if you want to drop it" to "Let's try it within these limited restrictions" following more testing and a better understanding of the weapon's capabilities. Initially we carried a GBU-54 and a GBU-12 on each mission, and later we moved to two GBU-54s because of their greater flexibility over the standard LGB.

'The culmination of all this hard work came in July when VMA-513 became the first AV-8B unit to expend a GBU-54 in combat.

'During our time in-theatre we worked for the Marines and sometimes the Special Forces. Most of our support sorties went to the Marines in Helmand Province. We had the flexibility to support ground forces, and what helped us in the performance of this mission was the close integration of air and ground units within the MAGTF – we share a common background and usually know each other. One of our pilots, Capt Daniel Fuest, had gone to a FOB as a battalion air officer with 3rd Battalion, 4th Marines shortly before we arrived in Afghanistan. He knew everyone in our squadron and we knew him, and we delivered a lot of weapons for him during the deployment.

'Thanks to this close relationship, we have a deep understanding of the MAGTF concept. By the time we arrived at Kandahar we already had a good understanding of how Marines on the ground respond to an enemy threat through various stages of force escalation – initial reliance on organic firepower at squad level, then progression to artillery, rotary support and, finally, TACAIR with a bomb or a strafing run from a Harrier II. We also knew how these responses worked within the ROE in Afghanistan.

'I never saw any evidence of SAMs or heavy AAA being fired at our TACAIR while I was there. What I did notice from my time in Iraq and Afghanistan was that after 2004 the insurgents we encountered in OIF would never stand and fight. They would set off an ambush or an IED that inflicted casualties and then escape before air power could get them. Both before and during the Battle of Fallujah, the Iraqis would "shoot, shoot, shoot and then scoot". They seemed to be a little bit smarter than the Taleban. When the latter engaged our troops they would stay in the fight long enough for us to come in and hit them with aviation fires – bombs and guns – which surprised me. I do not know if it was low situational awareness on their part or a mentality of when you started the fight you had to see it through to the end.

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A VMA-513 AV-8B Night Attack Harrier II receives fuel from VMGR-252 KC-130J tanker BuNo 166472 over Afghanistan at dusk on 30 August 2011. The Hercules has both of its underwing hoses extended, the pilot who took this photograph having yet to plug his jet into the closest basket for fuel (*US Marine Corps*)

'When action commenced in Afghanistan we were more likely to engage with aviation than in Iraq. The Taleban could be fixed and killed with heavy air power. Perhaps it was the law of natural selection. The guys in Iraq had survived years of fighting and knew what the deal was. However, the guys in Afghanistan that we were hitting might have been new recruits coming in from Pakistan that did not know any better.

'Our normal mode was three cycles a day in OEF – a morning go, midday go and evening go – with two aircraft for each cycle. These turned into long missions, with the morning launch often being a five-hour cycle for each aircraft, the midday sorties usually lasting 3-3.5 hours and the night mission also running to five hours. We flew from sunrise well into darkness, as the Taleban tended to be most active at around sunrise and sunset. There was very little action at night, however. We modified our cycle of operations to be there when the Marines needed us most. That cycle had been adopted by the Hornet units before us, and we saw little need to change it. We did fly late night sorties if required, however – I recall performing just such a mission to cover a Special Forces team.'

As previously noted by Lt Col Lee, Capt Daniel Fuest served as the battalion air officer for the 3rd Battalion, 4th Marine Regiment in 2011. He was awarded the Bronze Star for his effective calling in of CAS from VMA-513 during heavy fighting in Helmand Province. 'I was just doing my job', Capt Fuest explained. 'The battalion had plenty of amazing Marines who did a lot more important stuff than I did'. Some of Fuest's most challenging moments came in late October 2011 when US Marine Corps and ANA forces commenced Operation *Eastern Storm* in an effort to clear the Sangin and Kajaki districts, in Helmand Province, of Taleban insurgents.

MAGTF artillery and Harrier IIs supported ground operations, Lt Col Robert Finneran, 2nd MAW forward operation officer, commenting at the time, 'We have been able to fly and support the ground combat element in any way asked. We are following a very well synchronised aviation plan'.

Capt Aaron Fry of VMA-513 signals to his groundcrew that he and his jet are 'good to go' at Kandahar on 27 September 2011. The miniature detonating cord canopy breaker is clearly visible above the pilot's head. Fry is firmly strapped to a UPC/Stencel type 10B ejection seat (*US Marine Corps*)

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Avionics technicians from VMA-513 utilise a memory loader verifier system (MLVS) on the flight controls of an AV-8B undergoing routine maintenance at Kandahar on 28 September 2011. The MLVS loads and updates software essential to pilots flying the aircraft. This aircraft has seven red bombs painted beneath its cockpit, denoting ordnance expended in combat, as well as six target designation symbols to the left of the VMA-513 'owl' (*US Marine Corps*)

Eastern Storm proved to be the last major operation supported by VMA-513 in OEF, the unit heading home to Yuma on 15 November 2011. By then it had flown 4033.8 combat hours during the course of 2261 sorties. The unit had supported 2145 JTARs and expended 81 PGMs totalling 64,647 lbs. It had also fired 4737 rounds of 25 mm ammunition in 50 strafing runs. Finally, the Harrier IIs had made 59 show of force flybys. VMA-513 had been supported throughout its time in-theatre by MALS-13.

Two weeks prior to departing Kandahar, VMA-513's relief arrived in-theatre in the form of ten jets from VMA-223. Thrown into action supporting *Eastern Storm* virtually as soon as the unit arrived in Afghanistan, VMA-223 had the fastest introduction to combat of any Harrier II squadron committed to OEF. It generated 288 combat sorties totalling 1203 flying hours within the first 51 days of the unit arriving at Kandahar. The unit was led by Lt Col Thomas P Gore, who commented on the role of the Harrier II pilot in OEF;

'Due to our background and training, we have a good understanding of the situation being faced by the Marines on the ground, and an absolute commitment to do everything within our powers to help them. That's easy to say when you are talking about "dropping a bomb and supporting the guys on the ground". However, the bulk of our time has been spent sweeping many kilometres of unpaved road with our Litening II pods looking for things that are suspicious – that is something that Marine aviation, not just the Harrier II, brings to the table. Nobody supports Marine infantry like Marine aviators. We knew that we were there specifically to support Marines outside the wire, and we were determined to see as many of them as possible successfully take the fight to the enemy and then come home safely.'

Capt Eric Albright of VMA-223 completed 159 combat missions whilst flying from Kandahar. Undertaking his first operational deployment, Albright engaged enemy forces on numerous occasions. Note the impressive bomb tally on the VMA-223 jet parked behind him (*US Marine Corps*)

One of Lt Col Gore's pilots to see action was Capt Eric Albright, who told a US Marine Corps public affairs officer about a night mission he had flown on 5 February 2012 over the Helmand River valley. He had been providing routine overwatch, scanning routes for insurgents placing IEDs, when Marines from the 2nd Marine Battalion, 4th Marine Regiment had spotted emplacers in the act and called for help. The initial plan, as described to him by the ground unit, was for the Marines to use artillery fire to hit the insurgents. This did not go as planned. The enemy ran from the target area to a nearby compound.

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Due to the increased chance of causing unnecessary damage to the surrounding area, the ground troops called off the artillery.

Having by now run low on fuel, Albright left the area to get refuelled and then returned to the target area, circling overhead and waiting for his chance to strike. Finally, as he refuelled for a second time, he got the call he was waiting for. 'I was about 20 miles away when another call came in', Albright explained. 'The voice on the radio said the insurgents had returned to the IED site. I flew with my wingman toward them, setting up my targeting pod. We were flying over a low light area, and by low light I mean, no light. If I looked out of my aircraft through the canopy, all I could see was black'.

As Albright arrived on scene, he saw two artillery impacts on the ground – the assault on the emplacers was underway. The Marines on the ground fired two shots, eliminating one of the targets but leaving the other four fleeing the area. Albright quickly located the targets hiding next to a shed.

'The plan was to have my wingman mark the targets with his targeting pod while he stayed overhead. I was going to descend and engage the enemy, shooting at my wingman's mark. I set my targeting pod up and had to keep moving it as the targets ran away. I had to use only my NVGs to see because it was pitch black outside.'

Albright commenced his dive and reached a speed of about 550 knots – the ideal speed for a gun attack. 'I squeezed the trigger and pulled out of the dive. All I could think about was "shoot and get out of there" because at that speed I was cutting it close by being only 1000 ft above the ground when I pulled up – a couple more seconds in the dive and I would have hit the deck'. Albright's run in to the target had been spot on, as had his aim. One insurgent was killed by the strafing pass and the remaining three were captured by Marines on the ground. 'If we take our enemy off the battlefield they can't take out our Marines', concluded Albright, who duly flew 159 combat missions during his tour in Afghanistan.

Lt Col Gore prided himself in the fact that VMA-223 almost always had a Harrier II overhead Marines that were out on patrol. This allowed the unit to offer MAGTF 'a very rapid kinetic strike option', and in turn led to some spectacular strikes being performed during the unit's time in Afghanistan. One such event was carried out by Capt Andrew Christ, who received an individual action air medal for hitting a Sport Utility Vehicle (SUV) that was carrying a team of insurgents who were attacking Marine patrols with a machine gun.

'That thing was going at 20-25 mph over undulating terrain, and he exercised a lot of tactical patience not dropping when he was cleared to drop because he was worried about killing or wounding innocent bystanders', Gore said. Christ tracked the vehicle for almost two

VMA-223's command jet during the unit's 2011-12 OEF deployment was AV-8B+ BuNo 166288, the very last remanufactured Harrier II delivered to the US Marine Corps. Amongst its colourful markings was the emblem of the 2nd Marine Division on the fin, VMA-223 providing CAS for troops from this unit whilst in-theatre – it also bears the name of the Commanding General of Task Force Leatherneck/2nd Marine Division (Forward), Brig Gen Lewis A Craparotta. The jet was photographed on 20 November 2011 flying over Kajaki Dam, in Helmand Province, unit CO Lt Col Thomas Gore at its controls (*VMA-223*)

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The personnel of VMA-223 came together at Kandahar on 8 April 2012 – just days before they returned home to MCAS Cherry Point. Both the command jet and the CO's aircraft (BuNo 165384) wore non-standard markings, the latter machine featuring aircraft the unit had flown since its formation in 1942. During its OEF deployment the squadron flew more than 4000 hours, with each of its ten aircraft flying an average of 71 hours per month. The unit responded to 2070 requests for air support and delivered 61,500 lbs of ordnance during 67 attacks. The hardworking support crews maintained a full-mission-capable rate of 76.5 percent for VMA-223's jets despite numerous rocket attacks on the base (*VMA-223*)

hours as it went from village to village in northern Helmand Province, waiting for it to get clear of populated areas. 'It presented a difficult tactical scenario because of the SUV's proximity to innocent women and children', Christ explained. 'Any time they got close to a compound, it forced me to abort the attack because I didn't want to risk hurting civilians'. Christ waited for the vehicle to enter an irrigation ditch before destroying it with a GBU-54.

VMA-223 enjoyed outstanding serviceability rates from its ten Harrier IIs on deployment, Lt Col Gore believing that this was achieved by giving his maintainers an insight into what their fellow Marines were facing out on patrol;

'Our number one goal was to support the Marines and be there anytime and anywhere that they needed support. We went to the limit of our ability to make sure our ten jets were ready to go. I also made sure that our pilots were in continual contact with the battalions on the ground so we understood what they would be doing on any given day so that we could help them if they needed it.

'The thing that really helped our squadron was that we kept the Marines who worked on the jets abreast of how dangerous it is in Afghanistan "outside the wire". Fellow Marines were out there on infantry patrols, and I talked to our maintainers about every operation the unit was supporting, and explained how their repair and rearming of our jets help to protect the guys outside the wire. All of the Marines in the squadron had security clearances, so we brought the maintainers in small groups to our base ops centre. Here, our operations duty officer, who was also a pilot, discussed in detail the activities on the ground and our air support. He also showed them Litening II pod and HUD imagery of the attacks we had made on the enemy. This helped our maintainers understand that they were directly contributing to saving the lives and limbs of the infantry Marines.

'We tried very hard to make sure the sergeants and NCOs in the maintenance department understood how important it was to keep the jets up, and the readiness rates they achieved in return were unprecedented

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for wartime. We went over to Kandahar with ten radar jets, and with these being harder to maintain than Night Attack Harrier IIs, the serviceability rates we enjoyed were all the more astonishing. We tallied more than 4000 flight hours with radar jets during our deployment. This was pretty amazing since we were there in the winter, where, for eight to ten days, we could not fly at all since we did not have a divert field available due to poor weather.'

In April 2012 VMA-223 was replaced at Kandahar by VMA-211, which was undertaking its first OEF deployment in ten years. The unit's XO, Maj John Havener, recalled VMA-211's preparations for its time in-theatre;

'In January 2012 we commenced the final phase of our training by undertaking multiple exercises at Twenty-Nine Palms. This proved to be invaluable as a lot of our pilots were very junior, although we also had a handful of senior, experienced, aviators. I led the advanced team in-country in April, and we took over the TACAIR tasking from VMA-223 at Kandahar on 1 May. We flew ten aeroplanes to Afghanistan with tanker support and operated from there until early July. At Kandahar we were just one of a number of fixed and rotary wing units supporting ISAF. With just a single runway, Kandahar was a very busy base.

'In early July we shut down Marine Corps operations there after the 3rd MAW completed the building of our spaces and facilities at Camp Bastion, this base being closer to the fight. We were the sole TACAIR unit operating from the new base in support of Marine operations in Helmand Province. At this time we flew a lot of ISR for the Marines, as well as roughly one kinetic event per week. As the deployment progressed the ANA began doing more and more of the operations. We had to relay radio communications from our JFACs to Afghan command centres in order to secure approval to support troops-in-contact.

'Our relationship with the Marines of Taskforce Leatherneck became much closer once we moved to Camp Bastion, as we were now living

VMA-231 CO Lt Col Thomas Gore (right) welcomes his counterpart from VMA-211, Lt Col Chris Raible, to Kandahar in April 2012. A veteran of multiple OEF and OIF deployments from 2001 onwards, Lt Col Raible was killed on the night of 14 September 2012 during the Taleban attack on Camp Bastion. Sgt Bradley Atwell from MALS-13 also perished, and nine military and civilian personnel were wounded. Finally, six AV-8Bs were destroyed and two badly damaged in what has been described as the most damaging attack on a US air base since the Vietnam War (*US Marine Corps*)

Capt Kevin Smalley of VMA-211 inspects fittings holding a GBU-54 JDAM to the underwing pylon of his Harrier II at Camp Bastion on 1 September 2012. The dual-mode 500-lb bomb quickly became the weapon of choice for AV-8B units in OEF following its combat debut with VMA-513 in July 2011 (*US Marine Corps*)

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The AV-8B requires regular maintenance and also periodic engine changes. As seen here, an engine change in the Harrier II is a major undertaking as the wing has to be removed and the engine lifted out with an overhead crane. This VMA-211 jet (BuNo 165422) was one of the first AV-8Bs to have an engine change at Camp Bastion following the transfer of US Marine Corps Harrier II operations there from Kandahar in July 2012. This photograph was taken on 2 September – 12 days later the aircraft was destroyed in the Taleban attack on Camp Bastion (*US Marine Corps*)

amongst "our own" once again. The base is divided up into the Marine Corps area, the airfield and the British area – the airfield is in fact British-run. I had completed an exchange tour with the RAF so I understood how we had to work together in order to get along. Flying the first fighter jets to be based at the airfield, we got a lot of support from everyone at Camp Bastion.'

Boeing airframe specialist and former Marine Willie Walker was part of a small team of civilian 'tech reps' who helped VMA-211's maintenance personnel keep their Harrier IIs in the air in 2012;

'The main problem we faced in Afghanistan was the fine, powdery, sand that plagued Helmand Province. It would find its way into everything – nozzles, and their drive systems, bearings, bell cranks, landing gear seals, ECS systems, everything. It forced us into having to perform a lot of preventative maintenance. Nevertheless, the mechanics knew their aircraft well, and they spent long hours keeping them in excellent shape – they were groomed to a high level. The jets flew a lot due to the heightened operational tempo expected in combat.'

On the night of 14 September 2012, VMA-211's CO, Lt Col Chris Raible, and Capt Kevin Smalley had just completed a routine mission and parked their jets when Camp Bastion came under attack from a force of 15 Taleban insurgents dressed in US Army uniforms. Having penetrated the outer perimeter of the base, the insurgents split into three groups of five and attacked the AV-8Bs in their temporary hangars on Lima Ramp, aircraft refuelling stations and VMA-311 personnel in tented areas near the flightline.

Hearing the noise of gunfire and explosions, Lt Col Raible and his aircraft maintenance officer (AMO), Maj Greer Chambliss, drove back to the flightline from the operations hut and organised a counter attack. Personnel from VMA-211, regular troops and a 15-strong quick reaction force of RAF Regiment gunners in their Jackal patrol vehicles, with air support (from a British Army Air Corps WAH-64 Apache and a US Marine Corps aviation attack team of an AH-1W and UH-1Y) engaged the Taleban and eventually killed all bar one of them – the sole survivor was captured. During the fighting Lt Col Raible and technician Sgt Bradley Atwell of MALS-16 were killed, several other Marines and a civilian technician wounded and six AV-8Bs destroyed and two more badly damaged. Willie Walker witnessed the attack;

'We had just come off maintenance, and all the jets for the next missions were fuelled, loaded and ready to go. I was in the airframes workshop, as we had one jet in phase inspection having its blast shield repaired. We heard the first explosion, then a second and then a third, which I thought were RPGs. At about that time two guys ran into the hangar shouting that they weren't rockets [they were actually F-1 anti-personnel grenades],

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the Taleban was on base and we were under attack. Believe me there was not a rifle in the rack one minute later, which left me looking for one.

'As the Marines covered the doors, there were rounds coming in through the side of the hangar and then flying out the opposite wall. We were in a metal-covered workshop, with dividers for work stations and no protection. The CO, AMO and other Marines raced up to the workshop in a vehicle, and Lt Col Raible came in and ordered the Marines out into the ditches surrounding the Lima Ramp in an attempt to fight back. It was at this point he got hit. Then an RPG came in our side of the hangar and detonated when it hit a door, wounding a few of the Marines who worked in the powerline [engine] shop. We just hunkered down while the guys outside fought back, and the guys inside passed their ammunition to those firing from the ditches. Eventually, several helicopter gunships appeared overhead and they contained the enemy threat.

The charred remains of AV-8B BuNo 165568 the morning after the 14 September 2012 attack that destroyed six Harrier IIs and badly damaged two others on Camp Bastion's Lima Ramp. The aircraft were blown up by Taleban insurgents armed with F-1 anti-personnel grenades (*US Marine Corps*)

'In the days following the attack we helped with battle damage assessment on the two jets that had survived, and worked with the Marines to get them prepared for shipment back to Cherry Point. The two VMA-211 jets that had been on detachment in Qatar at the time of the attack came back to Camp Bastion, and VMA-231 sent six jets over from Cherry Point [ahead of the unit's OEF deployment scheduled for October 2012]. We worked hard to clean up the mess and extend the flightline so that it was ready for the replacement aircraft.'

As noted by Willie Walker, two of VMA-211's jets were in Qatar at the time of the attack, this detachment being led by Maj John Havener;

'In mid August we received orders to reduce our det commitment to eight jets and 140 personnel for the final six weeks of the deployment. I would oversee the return of the surplus aircraft and Marines to Yuma. During our flight home, we had arranged to spend some time training in the Middle East [at Al Udeid air base, in Qatar]. We were still here exercising when the rest of the squadron was targeted by the Taleban. I flew back to Camp Bastion in a USAF C-12 to take command of the unit the morning after the attack. The airfield was still closed when we arrived. To see the flightline in that state made me feel sick to my stomach, as some of the jets were still smoking and others were just burnt-out shells. Fragments from the explosions were everywhere. The smell from the burning jets and ordnance was something I'll never forget. EOD [Explosive Ordnance Disposal] came and helped us clean up the remaining ordnance.

'The two jets we had in the Middle East came back and we created a new flightline. The 2nd MAW was already

The temporary memorial constructed at Camp Bastion on 19 September 2012 by VMA-211 to honour the unit's fallen CO, Lt Col Chris Raible. A similar memorial was created nearby for Sgt Bradley Atwell of MALS-13 (*US Marine Corps*)

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AV-8B BuNo 165572 returns to Camp Bastion on 18 September 2012, this aircraft being one of only two deployed jets from VMA-211 to survive the 14 September attack on the base. The unit had been ordered to send two of its aircraft back to MCAS Yuma as part of a force reduction in OEF, and the jets were exercising in Qatar at the time the Taleban struck. They were immediately ordered back to Camp Bastion, where they were joined a few days later by an advanced party of six aircraft from VMA-231 (*US Marine Corps*)

working on getting us replacement jets, and less than a week after the attack had taken place we were flying more missions per day than before it had happened. We received a lot of support from all of the Marines, from the wing down to all the other groups both in Afghanistan and at home.'

Lt Col Troy M Pehrson, former CO of VMA-214, was rushed to Afghanistan before the end of September to assume permanent command of VMA-211 and lead the unit in its continued operations in OEF through to the end of its deployment. On 1 November 2012 the unit returned to MCAS Yuma, having completed its six-month assignment to the 3rd MAW. Its place at Camp Bastion was taken by VMA-231, which was led by Lt Col Shawn Hermley;

'Our road to deployment to Afghanistan was a challenging one from an operational tempo standpoint. In early February 2012 the squadron welcomed home our 22nd MEU AV-8B detachment after a ten-month deployment – the longest US Navy underway deployment since 1972-73. That same month eight Harrier IIs from the squadron deployed aboard *Kearsarge* in support of the largest ever peacetime amphibious exercise [Exercise *Bold Alligator*]. From early February we had just eight months to rebuild and train the squadron in order to execute two simultaneous overseas deployments – eight aircraft to Afghanistan to support OEF and a six-jet detachment in support of the 26th MEU, embarked in *Kearsarge* with VMM-266. This was an operational tempo never before demanded of an AV-8B squadron preparing for OEF.

'In March, the squadron executed a four-week deployment for training to NAF El Centro with the purpose of providing "Blue Air" for Weapons and Tactics Instructor course 2-12, as well as MAG-31's Air Combat Element certification exercise. Three months later the squadron supported the 2nd MAW's Exercise *Mailed Fist*, a two-week long Large Force Exercise that enabled the MAW to train to fight as a whole. In mid July the entire squadron deployed for five weeks to Twenty-Nine Palms to participate in the Enhanced Mojave Viper (EMV) 7-12 – the final assessment of the squadron for OEF and the last heavy weapons live ordnance training opportunity for the 26th MEU detachment.

'By early September we were in the final stages of training and preparation for our planned deployment to Afghanistan in squadron strength [eight

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aircraft and 180 personnel], minus the six jets and 84 personnel assigned to the MEU detachment. We were scheduled to fly to Camp Bastion at the very end of September to replace VMA-211. The latter unit had deployed with ten aircraft, as had all previous AV-8B squadrons based in-theatre since the reintroduction of Marine fixed wing jets to Afghanistan in early 2009. As part of US force reductions in OEF, VMA-211 was in the process of redeploying personnel and two aircraft back to the US in order to lower their manning level at Camp Bastion to 126 people and eight aircraft. The decision to reduce the Marine TACAIR footprint in OEF had only recently been made, and VMA-231 reacted to this significant manning and aircraft adjustment accordingly.

'On the night of the attack on Camp Bastion, VMA-231 had just started the first of two pre-deployment leave periods, sending out half of the squadron while the remaining Marines continued to prepare the aircraft and equipment for movement to Afghanistan. We were also continuing to train and prepare the MEU detachment for its deployment, involving the transfer of 84 personnel and six AV-8Bs to VMM-266. Specifically, on that night, we had three aircraft and supporting personnel aboard *Wasp* conducting Carrier Qualification training.

Capt Stephen White of VMA-231 climbs out of the cockpit of his aircraft after completing the final leg of his flight from MCAS Cherry Point to Camp Bastion, via Moron, in Spain, and Al Udeid, in Qatar, on 26 September 2012. Note that his aircraft bears the names of Lt Col Chris Raible (beneath the cockpit) and Sgt Bradley Atwell (on the landing gear door) (*US Marine Corps*)

'I was notified of the attack by my boss, Col Robert Sofge [the CO of MAG-14 at Cherry Point] shortly after it had happened. The following day we assembled key staff members from VMA-231, VMA-223 and the MAG HQ to develop a course of action for an expected request to restore AV-8B capabilities to 3rd MAW in support of the RC(SW) Command Southwest mission in Afghanistan. Our initial assumption was that VMA-231 would be directed to deploy early, since we were within a month of the planned deployment date and we had completed all of our required pre-deployment training. By the end of our full day of planning for all possible requests, we had been notified to prepare AV-8Bs as combat replacements for the six destroyed jets. These aircraft would be sent to Camp Bastion to fly alongside the two VMA-211 aircraft that had been ordered back from Al Udeid.

'At the time of the attack we were in the middle of conducting the "final grooming" of our eight OEF aircraft, transferring and accepting jets for our MEU detachment and continuing to train pilots. This meant that we had a few aircraft that could be immediately launched on a transatlantic movement, but not enough to provide all six combat replacement aircraft as requested. Fortunately, sister-squadron VMA-223 was able to source several jets to make up the numbers.

'I recalled the entire unit from leave and liberty the day after the attack, scheduling a squadron formation on the morning of 16 September so that I could explain what had occurred in Afghanistan, to communicate our mission and to get to work. Within 48 hours of VMA-211 having been

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hit, we had prepared six mission-capable combat replacement aircraft, while continuing to conduct carrier qualifications on *Wasp*. By 18 September we had eight fully combat-capable aircraft ready to go, but a further four days would pass before strategic tankers were available to support the deployment.

'With the movement conducted over three legs – Cherry Point to Moron, Spain, Moron to Al Udeid, Qatar, and Al Udeid to Camp Bastion – six jets and 26 Marines from VMA-231 arrived in-theatre on 26 September. The squadron immediately transferred its aircraft to VMA-211, enabling Marine Aviation to provide CAS to the Marines and Coalition Partners of RC(SW).

'On 11 October the final two Harrier IIs allocated to support OEF departed Cherry Point following the same route as the first six, while the squadron's seven remaining aircraft were transferred to VMA-231 Detachment A for its early 2013 deployment with the 26th MEU. Some 130 Marines caught up with their aircraft at Camp Bastion as per the planned timeline, arriving on schedule in Afghanistan on 16 October for the originally planned Transfer of Authority between VMA-211 and VMA-231 nine days later.

'Arriving in Camp Bastion and seeing the damage from the attack was very sobering. We had all seen pictures and received briefs on the attack, but seeing it in person and receiving the first-hand accounts from Marines in VMA-211 was something else. The scars of the attack were all over the place – the burned and cratered concrete where an AV-8B once stood, the remnants of the sunshades that covered the aircraft, the two bullet-ridden AV-8Bs, shrapnel and bullet holes in the maintenance building and small craters in the ramp from rounds fired by the attack helicopter that supported the fight against the insurgents.

'Sometimes, especially during our recent counter-insurgency commitments in Iraq and Afghanistan, Marines living on a forward-deployed airbase have been removed from the true nature of the violent conflict we have been fighting. They need to be reminded of the seriousness of the mission, and the possible costs of the squadron's effectiveness being reduced. Prior to the attack on Camp Bastion, I had planned on addressing the entire squadron once we arrived in-theatre to pass on my perspective on combat and to set the stage for a continued reiteration of the "why we are here" mantra. When we arrived at Camp Bastion after the attack I knew I didn't have to make such a speech. No one could mistake the fact that we were in a combat theatre, and that people were actively trying to kill you – the scars of the attack were in your face and a constant reminder of the seriousness of our profession.

'By the time we arrived in Camp Bastion, significant improvements had been made to the force protection posture of the base and to the VMA flightline area. After the attack and prior to our full movement to the theatre, we also made some improvements to our own force protection training, weapon capability and overall reaction planning. Throughout our deployment, the base force protection posture was constantly evolving for the better, allowing us to focus on the air support mission while maintaining confidently vigilant to the possible threats.

'We deployed eight AV-8B Harrier II+ radar jets in-country. We had executed detailed planning and coordination to ensure that all of our

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aircraft had had Airframe Change 479 carried out, which allowed us to mount the Litening II pod on centreline pylon 4, opening up an additional PGM station for use under the wing. Aside from this upgrade, our jets were also the first to deploy with the ALE-47 countermeasures system, which was a major advance over the older ALE-39. As expected, our expendable loads were tailored to the threats in-theatre, and the ALE-47 provided greater capability and flexibility against all threat anti-air systems.

Two VMA-231 AV-8B Harrier II+s flown by Capts Jonathan Lewenthal and Eric Scheibe close up behind a KC-130J tanker during an 11 December 2012 mission over Afghanistan. Both jets are armed with AGM-65E Laser Mavericks, GBU-54 laser JDAM and GAU-12 25 mm cannon pods. They are also carrying Litening II pods on their centreline stations (*US Marine Corps*)

'Most of the time we flew with the Litening II pod, the 25 mm gun, two external fuel tanks and a pair of GBU-54 Laser JDAM, which can use both GPS and laser guidance. Often, we carried a mix of one GBU-54 with an Mk 82 500-lb bomb body [GBU-54(V)2] and the other with a BLU-126/B low collateral damage bomb body, which still weighed approximately 500 lbs but was only filled with 27 lbs of high explosive [GBU-54(V)4]. Carrying a mix of bomb bodies provided more options for the Ground Force commander when it came to deciding what weaponry was required according to the location of the target. Sometimes, depending upon the weather, we carried an AGM-65E Laser Maverick on one station and a GBU-54 on the other. This configuration also provided more options to the Ground Force commander when cloud cover precluded direct aerial observation of the target from higher altitude.

'Our standard configuration was to fly with external fuel tanks in order to provide more on-station time, which was critical for the counter-insurgency mission. With the external fuel tanks, we could easily provide one hour and 45 minutes time on station over the target area. Without the fuel tanks, our endurance would have been reduced to an hour in this environment. When kinetic fires were requested, the extra fuel increased the probability that we'd still have gas available to execute an attack while we waited for approval – a process that could be very slow due to collateral damage concerns and the associated elevated approval chain of authority.

'The extra fuel also provided more options for "yo-yo tanking", where we'd keep one aircraft overhead of a critical situation on the ground, while the other executed aerial refuelling. In this late stage of the counter-insurgency fight we rarely cleaned off the wings [ran out of ordnance], so the extra fuel from the external fuel tanks was more useful than the two extra weapons that could have been carried in their place.

'Our daily operations were scheduled to allow for sections of two Harrier IIs to be available on a rotating basis throughout the day and night, depending upon identified needs to support ISAF. We were flying long missions by utilising KC-130Js for both normal day aerial refuelling and large day/night operations, and USAF/NATO strategic tankers for our routine night sorties. Our standard flow was to conduct two aerial refuellings during the day for a five-hour mission, and normally a single

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aerial refuelling at night for a 3.7-hour mission. Our primary mission was airborne on-call CAS, and while we were waiting to be called to perform this, we'd execute MIR, where we'd utilise the Litening II pod to scan areas of interest in support of the ground forces.

'Other attack air assets under the control of the 3rd MAW at this time included Marine Corps AH-1Ws, UH-1Ys and *Harvest Hawk* C-130Js, as well as British Army WAH-64 Apaches. Marine Corps-controlled UASs and ground-based aerostat balloon cameras, while not attack assets, also played a critical role in the detection, tracking and identification of the enemy that in turn facilitated kinetic attacks. RC(SW), the headquarters responsible for ISAF operations in southwest Afghanistan, also had Marine HIMAR [Highly Mobile Artillery Rocket System] rockets and 155 mm artillery capabilities to support the kinetic fight.

'Each of these systems have advantages and limitations – the Harrier II has the speed to quickly traverse the large battle space in response to developing situations and provide heavy firepower when required. Surface-to-surface GPS-guided rockets are precise and all-weather, but have a shorter range and take the most time to coordinate. Attack helicopters are forward deployed close to the action, are very effective for close in combat, can see activities on the ground well and can loiter for long periods. However, they are slow and announce their presence to the enemy through excessive noise. Finally, although the Marine Corps' C-130J *Harvest Hawk* can loiter for hours without refuelling and can deliver many small-warhead precision weapons, it is less nimble when reacting across a large area of responsibility.

'Together, all of these weapons systems were synergistic, and it was the job of the Tactical Aircraft Command Center of the 3rd MAW and the Combat Operations Center [COC] within the RC(SW) to ensure that these systems and all aviation assets remained complementary in response to dynamic situations on the battlefield.

'The Harrier II also brought with it some unique aviation capabilities that weren't duplicated by other deployed RC(SW) assets during our deployment – aerial interdiction in the form of heavyweight ordnance delivery, anti-air defence, and electronic warfare.

'During much of VMA-231's flight time we used the Lantirn II pod for MIR while waiting to be called on to provide CAS. With the latter mission, we were either diverted to a situation that had arisen or hostile actions were detected with the Lantirn II that then led to a CAS attack.

'ISR and the collection of battlefield information has dramatically increased during our many years in Afghanistan. There are a lot more UASs in support of battalion-level operations than when I was in Iraq in 2007, and even more than my previous time in Afghanistan in 2009-10. Almost all FACs and JTACs now have the required equipment – ROVER, Strike Link and other systems – to view the sensor video of multiple airborne platforms in real time, including the feeds from tactical targeting pods, UASs and other ISR platforms. Additionally, the majority of the fixed positions in-theatre employ an aerostat balloon to hoist a camera for viewing the battle space.

'The increased number of video receivers, aerostats and aviation MIR/ISR assets available to the battalion has raised the level of battlefield awareness in the COCs, and this has improved efficiency when it comes to targeting

OIF and OEF veteran Lt Col Shawn Hermley led VMA-231 during its final deployment to Afghanistan in 2012-13. He is seen here holding a plaque awarded to the unit by Boeing on 17 June 2013 after VMA-231 had passed 30,000 consecutive mishap-free flight hours. This was the first time in the unit's history that it had achieved a milestone of this magnitude, VMA-231 taking a decade to accrue the 30,000 flight hours (*US Marine Corps*)

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the enemy – with either lethal or non-lethal force – through improved detection rates, timely target correlation and increased accuracy of fires. Now, JTACs are almost stunned if they have to try and pinpoint an enemy position without the availability of these video tools. In such situations they have to talk us onto a possible target via radio instead. To be fair, our proficiency in the cockpit also suffers in such situations as we too have become accustomed to the JTAC conducting the target talk-on by viewing the pilot's video feed via ROVER.

Capt Eric Scheibe, flying BuNo 164562, takes on fuel from a KC-130J tanker on 11 December 2012. Assigned to the unit CO, Lt Col Shawn Hermley, this aircraft featured full colour unit markings and *Ace of Spades* and *The First and the Finest* titling on its fin. Note the replacement panel on the intake lip and the light grey gun pods and drop tanks (*US Marine Corps*)

'In 2009-10, when I was last in Afghanistan [with VMA-231], we flew almost all of our missions in direct support of Marine battalions that were constantly patrolling their battle space. During our 2012-13 deployment, our customers were quite different. The few Marine battalions within the AO in 2012-13 were operating in a supporting role of the Afghan National Security Forces as part of the planned transition and eventual departure of US and NATO forces from Afghanistan. We also had two Georgian battalions – their AOs were very active – and troops from the British Army that were assigned battle space within RC(SW)'s AO.

'Marine JTACs from the Air Naval Gunfire Liaison Company were attached to non-US Coalition battalions, primarily supporting the Georgians and some Afghan units. This meant that we got to operate with Marine JTACs when providing them with CAS. In 2013 we also provided much more support to US and NATO Special Operations Forces – especially Marine Special Operations Regiment teams – both from aerial attack asset and assault support standpoints, covering heli/tiltrotor-borne assaults and raids.

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'With the increased ISAF focus on the elimination of collateral damage – amongst both civilians and their property – I was rather surprised by just how many CAS attacks we executed during our time at Camp Bastion in 2012-13. In the first four months of our 2009-10 deployment (prior to Operation *Moshtarak* in Marja), our squadron had only executed one 25 mm gun attack in support of an engaged Marine unit and one pre-planned JDAM attack. On the second day after assuming responsibility in 2012, the squadron conducted its first GBU-54 attack. This was just the start of a steady execution of attacks, averaging at least one per week.

'Despite the increased focus on collateral damage, I'd attribute the continued kinetic strikes across all aviation assets in-theatre to the larger number of airborne sensors and video receivers in-theatre. With reduced US/NATO manning levels we now also had more area to cover. Finally, we were providing increased air support to Special Operation Forces.

'In February 2013 VMA-231 was extremely fortunate to have the opportunity to execute a mission that would be the most significant event, and have the greatest impact on the enemy, during our deployment. And, as far as we can determine, it made history as the largest Marine Corps aviation strike during US combat operations in Afghanistan. Although I can't get into all of the mission details, I can provide the pertinent portions of the execution.

'This particular operation had been on and off again multiple times during our deployment, starting all the way back when we were conducting the turnover with VMA-211. After multiple iterations of posturing for the mission, and standing alert during those time periods, we finally received the execute order. On the day of execution, we had seven out of our eight AV-8Bs ready to fly the mission – we were awaiting parts for the eighth jet. Once we received the execute order, we launched as planned, with all seven aircraft carrying four 1000-lb GBU-32s. Within an hour of receiving the order to "go", we employed 27 GBU-32s within a three-minute window, which resulted in devastating effects.

'The AV-8B attack was followed up by other aircraft and UASs carrying small warhead precision missiles to clean up some of the

The personnel from VMA-231 come together for a squadron photograph at Camp Bastion on 19 March 2013. During operations in Afghanistan the squadron completed 778 sorties for a total of 2825.5 flying hours, and delivered 107,432 lbs of ordnance (*VMA-231*)

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smaller targets, and targets closer to objects of collateral damage concern.

'Unexpectedly, late that same evening, we were asked to conduct a similar attack the following day due to the limited effect the follow-on air assets had had on the targets that remained. The next day we launched all six available AV-8Bs, armed with a mixture of 500- and 1000-lb JDAM weapons matched to the specific targets to be attacked. This second attack was completed within a two-minute window, seeing the delivery of 24 weapons.

'In all, the squadron had employed 51 JDAM within a five-minute window during two missions, the bombs having a significant and far reaching impact on the enemy. My Marines did an outstanding job in every aspect of the planning and execution of this mission, once again pulling together during a critical time and performing flawlessly. We were making a difference on every combat flight we performed, but these two strikes made the effect very tangible.'

VMA-231 completed its final OEF deployment in April 2013, by which point it had supported 36 named operations, conducted 31 electronic warfare missions and performed 1164 JTARs. Some 107,432 lbs of ordnance had been expended during 778 sorties (76 percent during the day and the rest at night), totalling 2825.5 flying hours.

CAPT JO
WARNING
THIS AIRCRAFT CONTAINS A CARTRIDGE – ACTUATED EMERGENCY ESCAPE SYSTEM EQUIPPED WITH EXPLOSIVE CHARGES. SEE APPLICABLE MAINTENANCE MANUAL FOR COMPLETE INSTRUCTIONS
DANGER
DANGER
DANGER

Lt Col Scott Mitchell, CO of VMA-311, conducts his preflight cockpit checks at Camp Bastion on 9 August 2013. Note the NVG attachment on the front of his helmet (*US Marine Corps*)

VMA-231 had enjoyed outstanding serviceability rates from its eight aircraft thanks to the work put in by its maintenance team, who were supported by civilian 'tech reps', including Chuck Dowdle from Rolls-Royce;

'In December 2012 I returned to Afghanistan for a third time, troubleshooting engines. Conditions at Camp Bastion were so much better than Kandahar because there were no heavy aircraft operations to stir up FOD. They had cement ramps, rather than AM-2 steel matting, and even though we were only about 60 miles from Kandahar, and at nearly the same elevation, the weather was better – no driving winds as the latter base. Now, we weren't having to spend 300 hours a month on FOD prevention. And while I was with VMA-231 the unit did not have to pull an engine for FOD.

'With VMA-231 deploying with only eight jets, a lot of work had to be done to ensure that the unit had two flying at all times and four ready to go for the following missions. The remaining two would be in maintenance. Lt Col Hermley wanted to fly a two-ship launch around the clock. We would fly from 0700 hrs to perhaps 0200 hrs the following day non-stop, so we had to work hard to have jets ready for sustained operations. VMA-231's presence at Camp Bastion was only a little larger than a typical six-aircraft MEU detachment, although of course we had the CO and his command staff. We did not have time to do anything twice.

'Nevertheless, we exceeded the serviceability rates achieved by previous units, even though we had only radar-equipped jets in-theatre that had

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more systems in them to go wrong when compared to Night Attack Harrier IIs.

'Over the years a lot of work has been done to keep the AV-8Bs as up to date as possible, both within the squadrons and at depot level. The Harrier II MAGs have pushed hard to make sure that the jets have had the latest mods, mission computer and operational flight programme upgrades and improved wiring to carry the newest weapons, systems and iterations of the Litening II pod for increased operational effectiveness.'

On 17 April 2013 VMA-311 returned to Afghan skies for the first time in more than 11 years when the unit was led to Camp Bastion by its CO, Lt Col Scott Mitchell;

'We initially conducted left seat/right seat rides with VMA-231 in order to get up to speed on operations in Helmand Province, before assuming responsibility for the AOR on 25 April. The squadron quickly established an operational rhythm supporting priority and routine JTARs, as well as named operations. The assigned mission sets changed very little with the departure of VMA-231, but as the weather moderated and the hours of daylight lengthened, we modified the sortie flow. Instead of a three-vul [vulnerability period, when aircraft on patrol are responsible for providing CAS in their assigned AO] morning launch and a two-vul afternoon launch, we flew three two-vul launches, each supporting up to four planned JTARs. Although this increased the challenge for the maintenance department, it reduced aircrew fatigue and provided surge capability to rapidly meet pop-up tasking with fresh aircrew and aircraft.

'Our standard load-out continued to be two GBU-54s (one fitted with a low-collateral damage warhead), the 25 mm gun and the Lantirn II targeting pod. Ground commanders preferred the gun for targets in built-up areas for both collateral damage and political reasons. Targets in the open were usually prosecuted with a single GBU-54. On occasion, we were assigned a pre-planned strike, like the one VMA-231 conducted in February 2013 when a large target set was prosecuted with multiple aircraft dropping multiple bombs.'

A pair of VMA-311 AV-8Bs fly over Helmand Province prior to tanking from a KC-130J on 10 June 2013. Both jets are armed with two GBU-54 laser JDAM. Eight Harrier IIs from VMA-311 arrived at Camp Bastion on 17 April 2013, the unit returning to Afghan skies for the first time in more than 11 years (*US Marine Corps*)

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VMA-311 pilot Maj Ben Beard, who had participated in the assault on Fallujah in 2004, flew some of the last OEF missions undertaken by the Harrier II;

'We knew prior to our arrival that it would not be a highly kinetic campaign. Aside from our primary role as a CAS platform, the Harrier II provided a defensive air-to-air capability and was employed as an organic electronic warfare platform that could be used by the ground combat element during coordinated raids on enemy positions. Whether conducting a strike, escorting a convoy, providing CAS or intercepting unidentified aircraft, the AV-8B was the right aircraft for the mission sets in OEF. It brought true expeditionary basing capability in a multi-role platform capable of delivering ordnance with unparalleled precision.

'Despite the 2nd MAW reducing its force strength in OEF in line with the withdrawal of US forces, our operational tempo remained high. Indeed, we were flying more than three times our budgeted airframe utilisation, but our maintenance Marines ensured our success as they continually performed beyond expectations. During five months of sustained combat operations, with more than 500 combat flight hours being tallied each month, readiness rates met or exceeded all previous AV-8B units in OEF, and the squadron never failed to support an assigned combat mission.'

On 11 September 2013 – the 12th anniversary of the terrorist attacks on American soil – VMA-311 flew its final combat mission in support of OEF, employing two 500-lb JDAM on an unoccupied enemy firing position. One of the squadron's most junior pilots, call-sign 'Shakin', remembered the mission;

'I was in the overhead above a FOB Base receiving a nine-line to employ ordnance on an old Soviet observation post that was frequently used by the insurgents. As I felt the thump of the bombs coming off, time seemed to slow down. As soon as I looked out I saw the hits, where once there was a structure on top of what looked like an ant hill, now there was nothing but a crater.'

During VMA-311's five-month combat deployment it flew 750+ sorties totalling more than 2700 flight hours and employed in excess of 15,000 lbs of ordnance. When the unit departed Camp Bastion and headed home to Yuma on 20 September, VMA-311 made history (just as it had done five years earlier when the squadron became the last operator of the Harrier II to leave Al Asad air base in Iraq) by being the final shore-based AV-8B squadron to engage in combat operations in Afghanistan.

This photograph was taken on 14 September 2013, three days after VMA-311 had completed its final combat mission in support of OEF. During the unit's five-month combat deployment it had flown 750+ sorties totalling more than 2700 flight hours and employed in excess of 15,000 lbs of ordnance (*VMA-311*)

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APPENDICES

AV-8B HARRIER II UNIT DEPLOYMENTS TO OEF

VMA-211 'WAKE ISLAND AVENGERS'

1 December 2001 to 18 June 2002 – VMA-211 'Det A', 13th MEU-SOC/HMM-165, USS *Bonhomme Richard* (LHD-6)

14 April 2012 to 25 October 2012 – VMA-211, Kandahar and Camp Bastion

VMA-214 'BLACK SHEEP'

14 May to 14 November 2009 – Kandahar

VMA-223 'BULLDOGS'

20 September 2001 to 20 April 2002 – VMA-223 'Det A', 26th MEU-SOC/HMM-365, USS *Bataan* (LHD-5)

30 June 2007 to 1 February 2008, VMA-223 'Det A', 22nd MEU-SOC/HMM-261 USS *Kearsarge* (LHD-3)

31 October 2011 to 7 May 2012 – VMA-223, Kandahar

VMA-231 'ACES'

5 November 2009 to 9 May 2010 – VMA-231, Kandahar

16 October 2012 to 22 April 2013 – VMA-231, Camp Bastion

VMA-311 'TOMCATS'

13 August 2001 to 4 March 2002 – VMA-311 'Det B', 15th MEU-SOC/HMM-163, USS *Peleliu* (LHA-5)

17 April 2013 to 20 September 2013 – VMA-311, Camp Bastion

VMA-513 'NIGHTMARES'

2 October 2002 to 30 August 2003 – VMA-513, Bagram

21 May to 15 November 2011 – VMA-513, Kandahar

VMA-542 'TIGERS'

22 February to 30 August 2002 – VMA-542 'Det A', 22nd MEU-SOC/HMM-261, USS *Wasp* (LHD-1)

17 February to 18 September 2004 – VMA-542 'Det A', 22nd MEU-SOC/HMM-266, USS *Wasp* (LHD-1) and Kandahar

6 June to 6 December 2006 – VMA-542 'Det A', 24th MEU-SOC/HMM-365, USS *Iwo Jima* (LHD-7)

20 February to 15 October 2008 – VMA-542 'Det A', 24th MEU-SOC/HMM-365, Kandahar

AV-8B HARRIER IIS INVOLVED IN OEF

VMA-311 'Det A', 15th MEU-SOC/HMM-163, USS *Peleliu* (LHA-5), 8/01-3/02
BuNos 164142, 164152, 164566, 165398, 165430, 165573

VMA-223 'Det A', 26th MEU-SOC/HMM-365, USS *Bataan* (LHD-5), 9/01-4/02
BuNos 163876, 164126, 165384, 165385, 165386, 165387

VMA-211 'Det A', 13th MEU-SOC/HMM-165, USS *Bonhomme Richard* (LHD-6), 12/01-6/02
BuNos 164119, 164128, 165397, 165424, 165427, 165567

VMA-542 'Det A', 22nd MEU-SOC/HMM-261, USS *Wasp* (LHD-1), 2-8/02
164551, 164554, 164559, 164567, 165310, 165311

VMA-513, Bagram, 10/02-9/03
163867, 163868, 163883, 164127, 164141, 164146

VMA-542 'Det A', 22nd MEU-SOC/HMM-266, USS *Wasp* (LHD-1) and Kandahar, 2-9/04
164014, 164015, 164551, 164559, 165004, 165309

VMA-542 'Det A', 24th MEU-SOC/HMM-365, USS *Iwo Jima* (LHD-7), 6-12/06
163876**, 163880, 164140, 164569**, 165001, 165004, 165005*, 166288
*lost in accident on 2/7/06
**attrition replacements from 21/7/06

VMA-223 'Det A', 22nd MEU-SOC/HMM-261 USS *Kearsarge* (LHD-3), 6/07-2/08
163864, 163876, 164387, 164562, 165357, 165385

VMA-542 'Det A', 24th MEU-SOC/HMM-365, Kandahar, 2-10/08
163380, 164119, 164556, 165001, 165307, 166288

VMA-214, Kandahar, 5-11/09
163868, 163870, 164134, 164143, 164154, 164545, 165311, 165389, 165421, 165574

VMA-231, Kandahar, 11/09-5/10
164551, 164552, 164554, 164569, 165004, 165306, 165312, 165355, 165356, 165594

VMA-513, Kandahar, 5-11/11
163883, 164128, 164159, 164571, 165380, 165567, 165574, 165580, 165591, 165595

VMA-223, Kandahar, 10/11-5/12
165307, 165309, 165357, 165384, 165386, 165388, 165593, 165596, 165597, 166288

VMA-211, Kandahar and Camp Bastion, 4-10/12
164562**, 164570*, 165308*, 165356**, 165383**, 165387**, 165390**, 165422*, 165568*, 165570*, 165572, 165578*, 165583, 165588, 165594
*aircraft destroyed by Taleban on 14/9/12
**aircraft borrowed from VMA-231 post-14/9/12

VMA-231, Camp Bastion, 10/12-4/13
164556, 164557, 164562, 165356, 165383, 165387, 165390, 165556

VMA-311, Camp Bastion, 4-9/13
164556, 165382, 165419, 165425, 165569, 165581, 165585, 165587

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COLOUR PLATES

1
AV-8B BuNo 164142 of VMA-311 Detachment B, 15th MEU-SOC/HMM-163, USS *Peleliu* (LHA-5), Arabian Sea, November 2001

AV-8B build number 215, BuNo 164142 was constructed as a Night Attack aircraft and delivered to VMA-311 at MCAS Yuma on 28 July 1992. In August 2001 this aircraft was one of six jets deployed by VMA-311 'Det B' with HMM-163 as part of the 15th MEU-SOC embarked in LHA-5. The detachment subsequently flew the first missions performed by the Harrier II in OEF while *Peleliu* sailed off the coast of Pakistan. The aircraft were armed exclusively with Mk 82 500-lb GP 'dumb' bombs during these early sorties over Afghanistan, the jets also carrying two 300-gallon external fuel tanks. This aircraft later operated with VMA-311 in OIF I off *Bonhomme Richard*, served with VMA-211 and VMA-513 and was flying with VMA-214 in 2013.

2
AV-8B BuNo 164566 of VMA-311 Detachment A, 15th MEU-SOC/HMM-163, USS *Peleliu* (LHA-5), Arabian Sea, November 2001

AV-8B build number 251 was delivered to VMA-223 at MCAS Cherry Point on 29 July 1994. It was later transferred to VMA-311, and in August 2001 this aircraft was one of six jets deployed by VMA-311 'Det A' with HMM-163 as part of the 15th MEU-SOC embarked in LHA-5. The aircraft also saw action in OIF I with VMA-311, again being flown by 'Det A' as part of the 15th MEU-SOC/HMM-161, but this time from the deck of USS *Tarawa* (LHA-1). Indeed, it was assigned to detachment commander, Maj Bradford Gering. This aircraft subsequently served with VMA-513 at Al Asad between March and September 2006, before being transferred to VMA-211 in-country when it replaced the 'Nightmares' – all ten jets from the latter unit were handed over to the 'Wake Island Avengers'. BuNo 164566 is presently serving with VMA-231.

3
AV-8B BuNo 165385 of VMA-223 Detachment A, 26th MEU-SOC/HMM-365, USS *Bataan* (LHD-5), Arabian Sea, December 2001

AV-8B build number 301 was the 18th remanufactured AV-8B Harrier II+ to be completed, the aircraft using parts from AV-8B BuNo 162946. Delivered to VMA-223 at MCAS Cherry Point on 15 December 1998, the aircraft deployed with five other AV-8Bs as VMA-223's 'Det A' within HMM-365 as part of the 26th MEU-SOC embarked in *Bataan* from September 2001. Arriving off the coast of Pakistan two months later, the unit supported the ground war in Afghanistan in the early stages of OEF. It is depicted here armed with AIM-9M IR-guided air-to-air missiles and a pair of 1000-lb GBU-16 LGBs. This aircraft subsequently saw combat in OIF I with VMA-223, and returned to Afghan skies with this unit's 'Det A' embarked in *Kearsarge* in 2007-08. Later assigned to VMA-214, BuNo 165385 is presently serving with VMA-211.

4
AV-8B BuNo 163876 of VMA-223 Detachment A, 26th MEU-SOC/HMM-365, USS *Bataan* (LHD-5), Arabian Sea, January 2002

AV-8B build number 184 was produced as a Night Attack aircraft and delivered to VMA-211 at MCAS Yuma on 1 May 1990. This jet was the oldest of the six Harrier IIs deployed by VMA-223's 'Det A' aboard LHD-5 for *Bataan's* OEF cruise, and it is also depicted here with two AIM-9Ms, two 1000-lb GBU-16 LGBs and a pair of 300-gallon external fuel tanks. The aircraft later served with the unit at Al Asad in 2005-06 during OIF III, and returned to Iraqi skies with VMA-223's 'Det A', embarked in LHD-3 as part of HMM-261, in September-October 2007 – 'Det A' also participated in OEF from *Kearsarge* on this cruise. Subsequently passed on to VMA-542, BuNo 163876 is presently assigned to VMA-223 once again.

5
AV-8B BuNo 165397 of VMA-211 Detachment A, 13th MEU-SOC/HMM-165, USS *Bonhomme Richard* (LHD-6), Arabian Sea, March 2002

AV-8B build number 308 was the 25th remanufactured AV-8B Harrier II+, which used parts from AV-8B BuNo 161580. Initially delivered to VMA-214 at MCAS Yuma on 8 July 1999, it was one of six VMA-211 jets embarked in LHD-6 as 'Det A' in December 2001. Supporting OEF operations during the first half of 2002, 'Det A' was particularly busy during Operation *Anaconda* in March of that year. The jet is depicted here in typical OEF configuration for that period, carrying two 500-lb GBU-12 LGBs and a pair of 300-gallon external tanks. This aircraft later saw combat in OIF I with VMA-214, flying from Ahmed Al Jaber air base in Kuwait. Returning to Iraq (Al Asad) in November 2004 with VMA-311 for a six-month deployment, BuNo 165397 is presently still assigned to this unit.

6
AV-8B BuNo 165311 of VMA-542 Detachment A, 22nd MEU-SOC/HMM-261, USS *Wasp* (LHD-1), Arabian Sea, July 2002

AV-8B build number 311 was the seventh remanufactured jet, which used parts from AV-8B BuNo 162074. It was delivered to VMA-542 at MCAS Cherry Point on 7 November 1997, and was one of six jets deployed by the unit's 'Det A' aboard LHD-1 that flew over Afghanistan in July 2002. These aircraft were the first Harrier IIs to deploy with the Litening II targeting pod, which allowed them to self-designate targets when performing PGM attacks with weapons such as the GBU-12 depicted in this artwork. BuNo 165311 saw combat in OIF I in 2003 with VMA-542 from *Bataan*, returning to Iraq (Al Asad) for OIF II in May of the following year. VMA-223 deployed with it to Al Asad for OIF III in 2005-06, and in 2009 BuNo 165311 was one of ten aircraft taken by VMA-214 to Kandahar. The aircraft was in depot overhaul in 2013.

7
AV-8B BuNo 163867 of VMA-513, Bagram, May 2003

AV-8B build number 175 was a Night Attack aircraft that was delivered to VMA-214 at MCAS Yuma on 18 December 1989. It was one of six aircraft deployed to Bagram by the unit from October 2002 through to September 2003. A typical mission load for aircraft from VMA-513 while in-theatre was a GBU-12 beneath one wing, an LAU-10D/A pod with four 5-in rockets beneath the opposite wing, GAU-12 25 mm cannon pods on the centreline and two 300-gallon external fuel tanks. BuNo 163867 is presently assigned to VMAT-203.

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8
AV-8B BuNo 164551 of VMA-542 Detachment A, 22nd MEU-SOC/HMM-266, USS *Wasp* (LHD-1), Arabian Sea and Kandahar, April to July 2004

AV-8B build number 293, a radar-equipped Harrier II+, was delivered to VMA-542 MCAS Cherry Point on 8 July 1993. This jet first saw action in OEF with VMA-542 from *Wasp* in 2002, then participated in the unit's OIF I deployment the following year, flying off *Bataan*. It returned to OEF with *Wasp* in 2004, 'Det A' putting all six of its jets ashore at Kandahar in April – they would remain here until late July. BuNo 164551, which returned to Kandahar with VMA-231 in November 2009, presently serves with VMA-223.

9
AV-8B BuNo 165004 of VMA-542 Detachment A, 24th MEU-SOC/HMM-365 USS *Iwo Jima* (LHD-7), Arabian Sea, September 2006

AV-8B build number 260 is a radar-equipped Harrier II+ that was delivered to VMA-231 at MCAS Cherry Point on 31 May 1995. The jet performed several combat deployments with VMA-542, including its OIF I cruise aboard *Bataan* in 2003. BuNo 165004 was committed to OEF IV from LHD-1 the following year, and also saw 12 days of action from LHD-7 and Kandahar in September 2006. During this period VMA-542 'Det A' jets were usually loaded with GBU-38 JDAM (a first for the Harrier II) and GBU-12 LGBs, the GAU-12 25 mm cannon pods on the centreline and two 300-gallon external fuel tanks. Each aircraft was also equipped with a Litening II targeting pod. The following month 'Det A' briefly participated in OIF IV, again from LHD-7. Later transferred to VMA-231, BuNo 165004 deployed with the unit to Kandahar in November 2009 for six months. The jet is presently assigned to VMA-542.

10
AV-8B BuNo 165357 of VMA-223 Detachment A, 22nd MEU-SOC/HMM-261, USS *Kearsarge* (LHD-3), Arabian Sea, October 2007

AV-8B build number 295 was the 12th remanufactured aircraft delivered, which used parts from AV-8B BuNo 162086. This jet was delivered to VMA-223 at MCAS Cherry Point on 13 June 1998, and it first saw combat with the unit's 'Det A' in OIF III in 2005-06 flying from LHA-4 and Al Asad. The aircraft also participated in VMA-223's 2007-08 'Det A' deployment aboard LHD-3, seeing combat in OIF V in September 2007 and then spending a week flying OEF missions the following month. BuNo 165357 returned to Kandahar with VMA-223 in October 2011, and it is presently still assigned to this unit.

11
AV-8B BuNo 164119 of VMA-542 Detachment A, 24th MEU-SOC/HMM-365, Kandahar, February to October 2008

AV-8B build number 196 is a Night Attack aircraft that was delivered to VMA-311 at MCAS Yuma on 10 December 1990. This aircraft flew in OEF with VMA-211 'Det A' from LHD-6 in 2001-02, saw combat in OIF I with the unit from *Bonhomme Richard* in 2003 and deployed again to OIF II in 2004-05 with VMA-211 'Det A', flying from LHD-2 and Al Asad. In 2008 it was one of six VMA-542 jets sent to Kandahar to serve with the newly formed MAG-40, 'Det A' remaining in-theatre for six months. BuNo 164119, still assigned to VMA-542, was lost on 18 July 2010 while attacking the Pinecastle bombing range in Florida. The aircraft was flying from LHD-3 in the final stages of the 31st MEU-SOC/HMM-262's pre-deployment work-ups at the time. The pilot ejected safely.

12
AV-8B BuNo 165421 of VMA-214, Kandahar, May to November 2009

AV-8B build number 314 was the 31st remanufactured jet, using parts from AV-8B BuNo 162731. This radar-equipped Harrier II+ was delivered to VMA-214 at MCAS Cherry Point on 10 February 2000. The aircraft flew with the unit from Ahmed Al Jaber during OIF I and saw combat with VMA-211's 'Det A' from both the flightdeck of *Tarawa* and ashore at Al Asad during OIF III in 2005-06. BuNo 165421's solitary OEF deployment came in 2009 when it served as the mount of VMA-214 CO, Lt Col Eric Schaefer, during the unit's six-month tour at Kandahar. The aircraft wore colourful markings (including bearing the name of the unit's first CO, Maj 'Pappy' Boyington, beneath the cockpit) throughout its time in-theatre. The jet is presently assigned to VMA-231.

13
AV-8B BuNo 165389 of VMA-214, Kandahar, May to November 2009

AV-8B build number 305 was the 22nd remanufactured jet, using parts from AV-8B BuNo 162744. It was delivered to VMA-542 at MCAS Cherry Point on 7 April 1999. The aircraft participated in VMA-214 'Det A's' OIF II deployment aboard LHA-3 in 2004-05, spending time ashore at Al Asad. It was also sent to Kandahar with the unit in 2009. BuNo 165389 is presently assigned to VMA-211.

14
AV-8B BuNo 164551 of VMA-231, Kandahar, November 2009 to May 2010

Radar-equipped AV-8B build number 293 was delivered to VMA-542 at MCAS Cherry Point on 8 July 1993. This jet initially saw combat in OEF in 2002 with VMA-542's 'Det A', flying from LHD-1. The following year it embarked in LHD-5 with 15 other Harrier IIs from VMA-542 for OIF I. In 2004, while still assigned to VMA-542, the aircraft embarked in LHD-1 once again and participated in OEF. BuNo 164551 subsequently joined VMA-231 and was deployed to Kandahar with the unit in November 2009. The jet is presently assigned to VMA-223.

15
AV-8B BuNo 164552 of VMA-231, Kandahar, November 2009 to May 2010

AV-8B build number 227, a radar equipped AV-8B Harrier II+, was delivered to VMA-542 at MCAS Cherry Point on 29 July 1993. This jet later moved to VMA-231, and it served in Afghanistan with the unit in 2009-10. Repainted in the newly introduced, more tactical, darker shade of grey, this aircraft was assigned to the squadron CO, Lt Col David Forrest – hence its full-colour unit markings, including battle honours on the fin. VMA-231's jets also had the capability to mount the Litening II pod on their centreline stores pylon, as depicted in this artwork. BuNo 164552 is presently assigned to VMA-542.

16
AV-8B BuNo 165574 of VMA-513, Kandahar, May to November 2011

AV-8B build number 332 was the 49th remanufactured jet, which included parts from AV-8B BuNo 162726. It was delivered to VMA-513 at MCAS Yuma on 31 July 2001. The aircraft served with VMA-311 aboard *Bonhomme Richard* during OIF I, deployed to MCAS Iwakuni in 2005-06 with VMA-214, joined VMA-311 upon returning to MCAS Yuma and was then transferred to VMA-513 in

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2007. It deployed with VMA-214 to Kandahar in May 2009 and returned to the base exactly two years later with VMA-513. BuNo 165574 is depicted here armed with a GBU-38 JDAM under its left wing (typically, a GBU-12 or a 5-in rocket pod would be carried beneath the right wing) and 25 mm gun pods. The aircraft also has its Litening II pod centrally mounted. BuNo 165574 remained with VMA-513 until the unit was deactivated on 12 July 2013, after which it was passed on to VMA-214.

17
AV-8B BuNo 165580 of VMA-513, Kandahar, June 2011

AV-8B build number 338 was the 55th remanufactured jet, and it included parts from AV-8B BuNo 163675. The aircraft was delivered to VMA-214 at MCAS Yuma on 22 January 2002, and it went to war with the unit from Ahmed Al Jaber during OIF I. The jet was based at Al Asad for OIF II in 2004, flew OIF IV missions in 2006 from LHA-5 and returned to Iraqi skies with the latter vessel in 2008 for OIF VI – indeed, it performed some of the last Harrier II missions of the campaign. BuNo 165580's solitary OEF deployment came with VMA-513 from Kandahar in 2011, the aircraft having distinctive artwork applied to its fin by Sgt Edwardo Amor in June of that year. Note the GBU-54 500-lb laser JDAM (a GBU-38 JDAM fitted with a laser seeker head) attached to the outer underwing pylon. This weapon was given its combat debut with the Harrier II during VMA-214's 2011 deployment. BuNo 165580 is still presently assigned to VMA-214.

18
AV-8B BuNo 165307 of VMA-223, Kandahar, October 2011 to April 2012

AV-8B build number 386 was the third remanufactured jet, and it included parts from AV-8B BuNo 161583. Delivered to VMA-231 at MCAS Cherry Point on 25 September 1996, the aircraft flew with VMA-542 off *Bataan* in OIF I and served with the unit at Al Asad in 2004 during OIF II. It was part of VMA-542's 'Det A' based at Kandahar with MAG-40 in 2008, and it returned to Afghanistan with VMA-223 in October 2011. BuNo 165307 is presently still serving with the unit.

19
AV-8B Bu No 165386 of VMA-223, Kandahar, October 2011 to April 2012

AV-8B build number 302 was the 19th remanufactured jet, which included parts from AV-8B BuNo 161583. It was delivered to VMA-223 at MCAS Cherry Point on 16 February 1999. This jet flew from *Bataan* with the unit's 'Det A' at the very start of OEF in 2001-02, and then saw further combat from LHD-5 during OIF I. It returned to Iraqi skies for OIF III in 2005-06 during VMA-223 'Det A's' embarkation aboard *Nassau* – the aircraft also spent time ashore at Al Asad during this deployment. BuNo 165386 was sent to Kandahar with VMA-223 in October 2011, and it is presently still serving with this unit.

20
AV-8B BuNo 165572 of VMA-211, Kandahar and Camp Bastion, April to October 2012

AV-8B build number 332 was the 49th remanufactured jet produced, and it included parts from BuNo 162726. The aircraft was delivered to VMA-513 at MCAS Yuma on 31 July 2001 and it deployed to OIF I with VMA-311 'Det A' embarked in *Tarawa*. It participated in OIF IV on two occasions, deploying to Al Asad with VMA-513 in March 2006 and remaining in-theatre when VMA-211 took over six months later. This aircraft survived the attack at Camp Bastion because it was one of two Harrier IIs that were en route back to MCAS Yuma when the Taleban struck. Sent back to Camp Bastion to help VMA-211 rebuild in the wake of the attack, BuNo 165572 is still assigned to the unit.

21
AV-8B BuNo 165588 of VMA-211, Kandahar and Camp Bastion, April to September 2012

AV-8B build number 346 was the 63rd remanufactured jet, which included parts from AV-8B BuNo 162730. It was delivered to VMA-513 at MCAS Yuma on 31 July 2001. A veteran of no fewer than four OIF deployments, the aircraft initially participated in OIF I with VMA-211, flying from LHD-6. It returned to Iraq with VMA-211 'Det A' in September 2004, flying missions both from LHD-2 and Al Asad. BuNo 165588 was assigned to VMA-513 when the unit deployed to Al Asad in March 2006 for OIF IV, and it was transferred to VMA-211 when the unit arrived in-theatre six months later. Sent to Kandahar with VMA-211 in April 2012, the aircraft was badly damaged in the Camp Bastion attack of 14 September.

22
AV-8B BuNo 165383 of VMA-231, Camp Bastion, September 2012 to April 2013

AV-8B build number 299 was the 16th remanufactured jet, and it included parts from AV-8B BuNo 162959. Delivered to VMA-223 at MCAS Yuma on 29 September 1998, it completed a single deployment to Iraq with VMA-223 from August 2005. The aircraft was sent to VMA-211 as an attrition replacement in the wake of the 14 September 2012 attack on Camp Bastion, having already been prepared for the deployment of VMA-231 at the end of that same month.

23
AV-8B BuNo 165390 of VMA-231, Camp Bastion, September 2012 to April 2013

AV-8B build number 306 was the 23rd remanufactured jet, which included parts from AV-8B BuNo 162741. Delivered to VMA-231 at MCAS Cherry Point on 18 May 1999, it embarked in *Nassau* with the unit's 'Det A' for OIF I and flew from Al Asad again with VMA-231 and VMA-542 in 2007-08 during OIF V. Like BuNo 165383 seen in the previous profile, this aircraft was sent to VMA-211 by VMA-231 as an attrition replacement in the wake of the 14 September 2012 attack on Camp Bastion, and it subsequently reverted back to the unit's ownership once VMA-231 commenced its OEF deployment. The aircraft is still presently assigned to VMA-231.

24
AV-8B BuNo 165425 of VMA-311, Camp Bastion, April to September 2013

AV-8B build number 318 was the 35th remanufactured jet, and it included parts from AV-8B BuNo 162950. The aircraft, which was delivered to VMA-311 at MCAS Yuma on 10 May 2000, served with VMA-211 embarked in LHD-6 in OIF I. Still serving with the unit in 2005-06, it supported OIF III from both LHA-1 and Al Asad during a six-month deployment with 'Det A' as part of HMM-163. BuNo 165425 was one of eight jets sent by VMA-311 to Camp Bastion to perform the final Harrier II deployment to OEF in April 2013. Assigned to unit CO Lt Col Scott Mitchell, it wore one-off tail artwork inspired by the squadron's World War 2 heritage – it had received its first fighters, F4U Corsairs, in April 1943. And although known for many years as the 'Tomcats', the squadron's nickname had originally been the 'Hell's Belles' – hence the titling at the base of the fin.

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CFAAC – Col Ben Hancock

MAG-13 – Col Anton Nerad

AV-8B Requirements – Lt Col William Maples

VMA-211 – Lt Col John Havener

VMA-214 – Lt Col Eric Schaefer and Maj James T Bardo

VMA-223 – Lt Col Thomas Gore (also MAG-40), Maj John K Adams and Capt Eric Albright

VMA-231 – Lt Cols David Forrest, Shawn Hermley and Joseph Williams and Capt Keith Bucklew

VMA-311 – Lt Cols Michael Gettings and Jason Maddocks

VMA-513 – Cols Marcus Annibale, James Dixon and Lt Cols Mike Franzak, Andrew Heino and Peter Lee

VMA-542 – Maj Pete Lee and Capt James Tanis

INDEX

References to illustrations are shown in **bold**. Plates are shown with page and caption locators in brackets.

A-10 Thunderbolt aircraft 26, 47, 48
aerial refuelling 15, 16, 23, **28,** 33, 53, **59**
Afghan National Army (ANA) 22, 53
AH-1W Super Cobra attack helicopters 8, 23, 49, 85
aircraft *see also* AV-8B Harrier II aircraft
  A-10 Thunderbolt aircraft 26, 47, 48
  AH-1W Super Cobra attack helicopters 8, 23, 49, 85
  C-130 Hercules aircraft **51,** 85
  CH-46 medium lift helicopters 8, **55**
  CH-53 heavy lift helicopters 8, 18, 23, 56
  F-14D Tomcat aircraft 20
  F/A-18 Hornet aircraft 7–8, **69,** 71–72
  KC-10 tankers 16, **26, 28, 43,** 53
  KC-130 tankers 15, 18, 33, 56, **59,** 64, 66, **74,** 84
  MH-47 Chinook helicopters 23
  MV-22 Osprey aircraft 56
  P-3C Orion aircraft 21
  Predator drones 21
  Tristar KC-1 tankers **23,** 25, 53
  UH-1Y liaison helicopters 8, 85
  V-22 tilt-rotor aircraft 8
  VC10 tankers 15
al-Qaeda 13, 21, 23, 26
Albright, Capt Eric **75,** 75–76
AN/AAQ-28(V) Litening II FLIR/laser designation pod 6, 8, 10, **10,** 12, 16, 24, **25,** 25, **26,** 29, 43, 44, 64
AN/APG-65 radar 6, 9, 11
ANA (Afghan National Army) 22, 53
Armée de L'Air 14, **17**
Atwell, Sgt Bradley **78,** 79, **80, 82**
AV-8B Harrier II aircraft
  aerial refuelling 15, 16, 23, **28,** 33, 53, **59**
  camouflage 70
  design and specification 6, 8–12
  ECS failures 28
  modifications 70, 71
  Operational Flight Programme 6
  technical faults 15–16
  upgrades 8–12

Bagram 23, 25–26, **26, 27,** 33, 48
Bataan, USS **3** (34, 92), **4** (35, 92), 14, 18, **19,** 19, **20,** 20–21, **21,** 22, 31
Bell, Capt Michael **4, 68**
Berryman, Capt Nathan 20, **21**
bin Laden, Osama 13, 21
Blake, Lt Col Peter 54–55
Blochberger, Lt Col Sean 31–47, **33, 43**
Bonhomme Richard, USS **5** (35, 92), 22, **22,** 23, 63
Boxer, USS 57
British Forces 13, 14, 15, **23,** 25, 50, 52, 53, 55, 56, 59, 85, 86
Buchan, Maj Toby 66–67, **68**
Bucklew, Capt Keith 67–68, **68**
Bush, President George W 13

C-130 Hercules aircraft **51,** 85
Camp Bastion **20** (40, 94), **21** (40, 94), **22** (41, 94), **23** (41, 94), **24** (41, 94), 59, 66, 67, 78–81, **79, 80, 81, 82,** 82–83, 87, **87, 88,** 88, **89**
Canadian Forces **51,** 52
CAOC (Combined Air Operations Center) 15
Carl Vinson, USS 14
CAS *see* Close Air Support (CAS)
CH-46 medium lift helicopters 8, **55**
CH-53 heavy lift helicopters 8, 18, 23, 56
Charles De Gaulle 14
Christ, Capt Andrew 76–77
CJTF *see* Combined Joint Task Force (CJTF)
Claypool, Lt Col Robert 9–10
Close Air Support (CAS) 7, 22, 26, 27, 29, 43, 44, 45, 48–49, 51, 52, 55, 90
Combined Air Operations Center (CAOC) 15
Combined Joint Task Force (CJTF) 26, 27, 43–44, 48

DeJong, Capt Dwight 20, **21**
design and specification 6, 8–12
Dixon, Lt Col Jim 25–28, **26**
Dowdle, Chuck 9, 88–89
Dutch Forces 52, 53, 55, 56, 70

Enterprise, USS 14
Expeditionary Strike Group (ESG) 8, 22

F-14D Tomcat aircraft 20
F/A-18 Hornet aircraft 7–8, **69,** 71–72
FAC *see* Forward Air Controller (FAC)
Fallujah 60, 65, 73, 90
Foreign Object Debris (FOD) 28, 33, 48, 58, 62, 88
Forrest, Lot Col David 61–63, **68**
Forward Air Controller (FAC) 16, 20, 30, 44, 45, 46, 47, 48–49, 54, 55, 68
Franzak, Lt Col Michael 25, 26, **29, 30**
Fuest, Capt Daniel 73, 74

Garibaldi 18
Garmsir 54, 55
German Forces 53, 70
Gore, Lt Col Thomas 23–24, 59–61, 75, **76,** 76–78, **78**
Gough, Maj Michael 22, 23

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Hancock, Col Ben 56–57, 72–73
Havener, Maj John 78, 80–81
Heino, Maj Andrew **28,** 28–29
Helmand Province **4,** 54, **58,** 60, 63, 73, **76,** 78
Hermley, Lt Col Shawn **4,** 63–67, 81–88, **85, 86,** 88
High Density Airspace Control Zone (HIDAZ) 65
Hutchins, Maj Benjamin 62, **68**

IEDs *see* Improvised Explosive Devices (IEDs)
Illustrious, HMS 14
Improvised Explosive Devices (IEDs) 54, 55, 64, 68, 76
intelligence, surveillance and reconnaissance (ISR) 6, **47**
International Security Assistance Force (ISAF) 7, 85, 87
Italian Forces 18, 52, 53, 56
Iwo Jima, USS **9** (36, 93), 50, **50,** 52

Kandahar **8** (36, 92–93), **11** (37, 93), **12** (37, 93), **13** (38, 93), **14** (38, 93), **15** (38, 93), **16** (39, 93), **17** (39, 93–94), 18, **18** (39, 94), 19, **19** (40, 94), 20, **20** (40, 94), **21** (40, 94), **32,** 33, 42–43, **44,** 46, **47,** 48, **51,** 52, 54, 58, 59, **60,** 62, 64, 69, 71, **72, 74, 75,** 78, **79**
KC-10 tankers 16, **26, 28, 43,** 53
KC-130 tankers 15, 18, 33, 56, **59,** 64, 66, **74,** 84
KC-135 tankers 53
Kearsarge, USS **3** (34, 92), **10** (37, 93), **53,** 53, **54, 55,** 81
"Keyhole CAS" 49

L3 Remote Operational Video Enhanced Receiver (ROVER III) **11,** 11, 67, 68
Lee, Lt Col Peter 51–52, 70–71, **71,** 72–74
Lively, Larry 28
Lwara 27, 29

Maddocks, Capt Jason 15–16, 18–19, **19**
Marine Air-Ground Task Force (MAGTF) 8
Marine Aviation Logistics Squadron (MALS) 58
Marine Expeditionary Unit (MEU) 6, **14,** 33, 42, 43–44, 45–48, 51, 52, 53, 55, 70
Marja 61, 65, 66, 68
McCorkle, Lt Gen Frederick 9–10
MEF (Marine Expeditionary Force) 8
MEU (Marine Expeditionary Unit) 6, **14,** 33, 42, 43–44, 45–48, 51, 52, 53, 55, 70
MH-47 Chinook helicopters 23
Miller, Capt Edward J 47–48
Mitchell, Lt Col Scott **88,** 89–90
MV-22 Osprey aircraft 56

Nassau, USS 54
NATO (North Atlantic Treaty Organization) 52, 53, 63–64, 86, 87
Nerad, Col Anton 69–72
Nicholson, Brig Gen Larry 57, 58

Obama, President Barack 56, 69
OFP *see* Operational Flight Programme (OFP)
Operation *Anaconda* (2002) **5** (35, 92), 23–24
Operation *Azada Wosa* (2008) 54–55
Operation *Cobra's Anger* (2009) 60–61
Operation *Desert Storm* (1991) 8
Operation *Eastern Storm* (2011) 74–75
Operation *Iraqi Freedom I* (2003) 10
Operation *Khanjar* (2009) 60
Operation *Moshtarak* (2010) **4**, 61, **65,** 65–68
Operation *Sinbad* (2006) 52
Operation *Southern Watch* (2002) 25
Operational Flight Programme (OFP) 6, 11, 24

P-3C Orion aircraft 21
Peleliu, USS **1** (34, 92), **2** (34, 92), 14, **14, 15, 16,** 17, **17,** 18, **18,** 21
Perez, Capt Michael 24–25
Predator drones 21

radar 6, 11
RAF *see* Royal Air Force (RAF)
Raible, Lt Col Chris **21, 78,** 79–80, **80, 82**
reconnaissance missions 47, **47,** 63–64
Restricted Operating Zone (ROZ) 65
ROE *see* Rules of Engagement (ROE)
Rolls-Royce Pegasus F402-RR-408 engines 6, 9
ROVER *see* L3 Remote Operational Video Enhanced Receiver (ROVER III)
Royal Air Force (RAF) 14, 15, **23,** 25, 50, 53, 59
ROZ (Restricted Operating Zone) 65
Rules of Engagement (ROE) 16, 63, 64, 69, 72, 73

Schaefer, Lt Col Eric 57–58
Scheibe, Capt Eric **84, 86**
"show of force" flybys 30
Smalley, Capt Kevin **78,** 79
STOVL AV-8B Harrier II *see* AV-8B Harrier II aircraft
Stricker, Capt Jarret **28**
Strike Link 54

Taleban, the **4,** 13, 18, 22, 26, 29, 43, 50, 53, 55, 58, 61, 63, 73, 74, 80
Tanis, Capt James 55–56
Tarawa, USS **2** (34, 92), 31
Thomas, Maj John 14–15, 17, 18, 19
Tristar KC-1 tankers **23,** 25, 53

UH-1Y liaison helicopters 8, 85
US Air Force (USAF) 14, 26, 46, 70
US Army 21, 56
US Marine Corps (USMC) *see also under* individual squadron designations
  aircraft numbers 10
  OEF 2001–02 13–21
  OEF 2002–03 22–30
  OEF 2004–06 31–52
  OEF 2007–10 53–68
  organization and strength 7–8
  reconnaissance missions 47, **47,** 63–64
  "show of force" flybys 30
  the surge 69–90
US Navy (USN) 7, 9, 14
US Special Forces 52

V-22 tilt-rotor aircraft 8
VC10 tankers 15
Vest, Col Kevin 56, 57
Vicksburg, USS **54**
VMA-211 'Wake Island Avengers' **5** (35, 92), **16, 20** (40, 94), **21** (40, 94), **22,** 22–23, **23,** 57–60, **78, 79,** 79–83, **80, 81**
VMA-214 'Black Sheep' **12** (37, 93), **13** (38, 93), **56,** 57, **57, 59,** 59–60, **60**
VMA-223 'Bull Dogs' **3** (34, 92), **4** (35, 92), **10** (37, 93), 18–21, **18** (39, 94), **19, 19** (40, 94), **20, 21, 53,** 53–54, **54,** 75–78, **76, 77**
VMA-231 'Aces' **4, 14** (38, 93), **15** (38, 93), **22** (41, 94), **23** (41, 94), **60,** 60–68, **62, 64, 65, 66, 68, 78,** 81–89, **82, 84, 85, 87**
VMA-311 'Tomcats' **1** (34, 92), **2** (34, 92), 14–18, **15, 17, 18, 19, 24** (41, 94), **88, 89,** 89–90, **90**
VMA-513 'Nightmares' **7** (36, 92), **10, 16** (39, 93), **17** (39, 93–94), 25–30, **26, 27, 30,** 63, **69,** 69–75, **71, 72, 74, 75**
VMA-542 'Tigers' **6** (35, 92), **8** (36, 92–93), **9** (36, 93), **11** (37, 93), **24,** 24–25, **25, 31,** 31–50, **32, 33, 43, 47, 49, 50, 51,** 54–56

Walker, Willie 79–80
Walters, Lt Gen Glenn 72–73
Wasp, USS **6** (35, 92), **8** (36, 92–93), 24, **24, 25,** 31, **31,** 33, **49,** 50
Werth, Maj Mark 18, 19–21, **21**
Williams, Maj Joseph 68, **68**

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Front Cover

On 13 February 2010 the US Marine Corps' 2nd Marine Expeditionary Brigade (Task Force Leatherneck) commenced Operation *Moshtarak* as part of the ISAF pacification offensive in the town of Marja, in Helmand Province. Involving 15,000 American, Afghan, Canadian, Estonian, Danish and British troops, it constituted the largest joint operation of the war in Afghanistan up to that point. Its aim was to remove the Taleban from Marja and eliminate its last stronghold in central Helmand Province. VMA-231 XO Lt Col Shawn Hermley was providing close air support for ISAF troops on the first morning of *Moshtarak*;

'I flew a strafing run mid-morning of the first day of the *Moshtarak* operation. Marja, which is surrounded by farmland, boasts numerous roads and a number of canals, most of which are tree-lined, with compounds spread about the town. My target was an enemy machine gun position situated in the courtyard of a mud-walled rectangular compound, with open ground in the middle. There were also a couple of small mud-walled dwellings sharing a wall with the compound, which was on an east-west running road in the town. The Marines that needed my help were approximately 800 m to the southwest of the target, taking cover on the south side of an east-west running agricultural berm that was in between two fields. There was open ground of agricultural fields between the enemy machine gun position and the Marine positions.

'Our attack run was executed from south to north, with the Marines on the left side of the cockpit (west side) as we executed our 25 mm gun attacks. The enemy machine gun was firing on a Marine unit to the south of the target. On that first day of Operation *Moshtarak*, every AV-8B section executed strafing attacks. During VMA-231's 2009-10 deployment we did not employ any rockets or AGM-65s. Therefore, the only low-altitude dive attacks we executed were 25 mm gun runs.

'We were carrying 25 mm High Explosive Incendiary rounds. When viewed from outside the cockpit, all expended 25 mm rounds produce a visible yellow-orange flame as they cycle out of the Gatling gun. At that time, we didn't have tracer rounds in our standard ammunition load-out. Tracers are "visible", and without them we can't see where the rounds are until they impact the target. Tracers produce a reddish glow from firing to impact, and they are typically loaded into the magazine as every fifth round. When the HEI rounds impact they explode, producing a small white glow – much like a sparkler – upon each impact, spreading shrapnel.

'I led the attack followed by my wingman, Capt Michael Bell, 30 seconds in trail. We couldn't confirm enemy killed or wounded in action, but the attack was effective as the friendlies were no longer receiving fire from that location after our strafing pass' (*Cover artwork by Gareth Hector*)

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